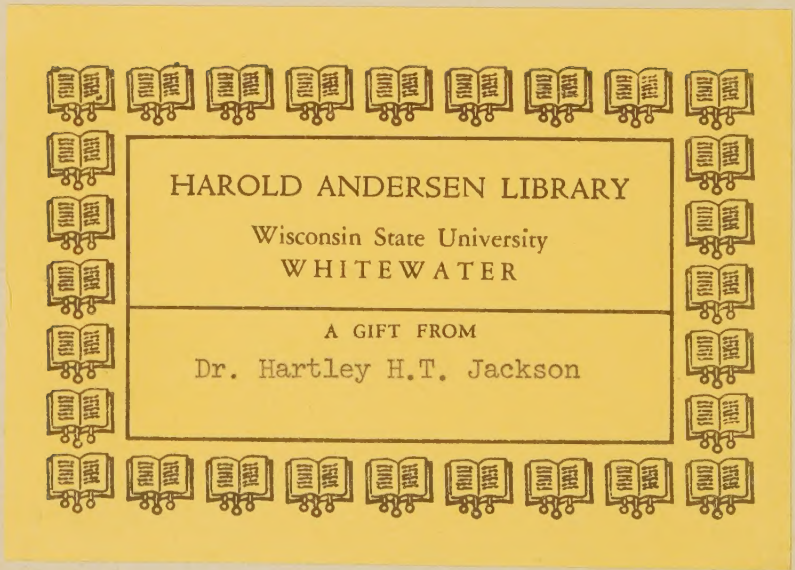
THE SHEEP AND ITS COUSINS

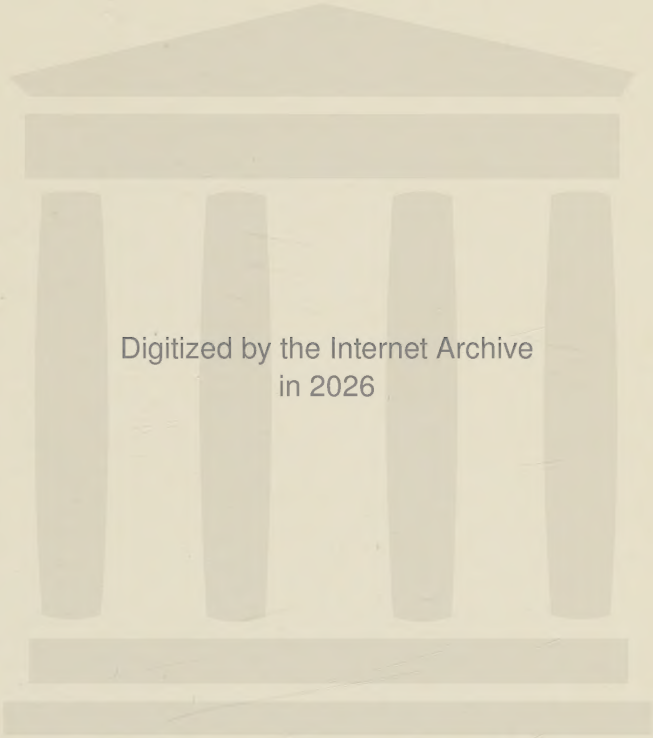
R. LYDEKKER, F.R.S.

H. H. T. Jackson


HAROLD ANDERSEN LIBRARY
Wisconsin State University
WHITEWATER
A GIFT FROM
Dr. Hartley H.T. Jackson

THE SHEEP
AND ITS COUSINS

GEORGE ALLEN
& COMPANY
LIMITED
RUSKIN HOUSE
PUBLISHERS
LONDON



Digitized by the Internet Archive
in 2026

H. H. T. Jackson

https://archive.org/details/sheepitscousins0000rlyd_r8l1

PLATE I

FIG. 1

FIG. 2

FIG. 1. Head of Mouflon Ram, with normal Horns.
FIG. 2. Head of Mouflon Ram, with abnormal Horns.

THE SHEEP
and
ITS COUSINS

BY

R. LYDEKKER, F.R.S.

AUTHOR OF "THE GAME ANIMALS OF AFRICA," "THE GAME ANIMALS OF INDIA, ETC." "WILD OXEN, SHEEP, AND GOATS," "THE DEER OF ALL LANDS," "A GEOGRAPHICAL HISTORY OF MAMMALS," "THE HORSE AND ITS RELATIVES," "THE OX AND ITS KINDRED," "THE SPORTSMAN'S BRITISH BIRDBOOK," ETC. ETC.

WITH 61 *ILLUSTRATIONS*

LONDON
GEORGE ALLEN & COMPANY, LTD.
44 & 45 RATHBONE PLACE
1912

[All rights reserved]

QL
737
U5L78

Printed by BALLANTYNE, HANSON & Co.
At the Ballantyne Press, Edinburgh

PREFACE

Although the sheep is one of the most valuable and important of all domesticated animals, affording as it does—in addition to food and other products—the main supply of material for woollen fabrics, yet there appears to be no modern book (at any rate in English) dealing with the chief breeds of all parts of the globe.

This gap I have endeavoured to fill by means of the present volume, which is written on the same general lines as *The Horse and Its Relatives* and *The Ox and Its Kindred*, and to which it is intended to form a companion. But, owing to the incompleteness of our knowledge of the sheep of many parts of the world—more especially Central Asia—it has to be confessed that the work can only be regarded as an attempt. As a matter of fact, our information with regard to many of the Central Asian breeds of sheep has scarcely advanced since the time of the German naturalist P. S. Pallas, who traversed Central Asia in the middle of the second half of the eighteenth century, and subsequently wrote a book on the sheep of those regions.

Although the subject is chiefly discussed from the natural history point of view, the mode of treatment ought to render the book useful and interesting to breeders and flock-masters, as well as to that large class of readers who take an intelligent interest in everything relating to the animal life of the world around them. Whether it will lead to experiments with regard to introducing into Great Britain the breeds of which the lambs yield the valuable "Astrakhan" pelts, the future alone will show.

As the various species and races of wild sheep are discussed in another and larger volume by myself, they are treated but briefly in the present one, which contains, however, fuller information with regard to many of the local races, and also indicates some important changes and modifications in classification.

In conclusion, it may be pointed out that although many modern naturalists affect to despise the study of domesticated animals, such master-minds as Charles Robert Darwin and Ernst Haeckel fully realised its value and importance, as is made evident by the following extract from the works of the latter :—

"Wild animals and plants, one year after another, appear approximately in the same form, and thus give rise to the mistaken doctrine of the constancy of species; domesticated animals and

plants, on the other hand, display great changes within a few years. The perfection attained by breeders and gardeners in the art of selection enables them to produce entirely new forms in a short time. For this purpose it is only necessary to keep and propagate the animal or plant under special conditions, when, after a few generations, new species may be obtained, differing from the original form in a much higher degree than do many wild species, or even genera, from one another. The importance of this fact cannot be over-estimated in connection with the origin of species."

As regards illustrations, my acknowledgments are due, and are hereby tendered, to the Trustees of the British Museum, the Royal Spanish Society of Natural History, the New York Zoological Society, the Municipality of Lyons and Professor C. Gaillard, the editor of *The Field*, Mr. R. J. Cuninghame, Dr. R. E. Drake-Brockman, Professor J. C. Ewart, Captain Stanley Flower, Dr. Conrad Keller, Sir E. G. Loder, Bart., Mr. Heatley Noble, Colonel H. Platt, Mr. R. I. Pocock, Colonel J. Manners-Smith, Mr. G. Stallard, and Mr. Rowland Ward.

Two photographs, sent by Colonel S. E. Prall, Chief Medical Officer at Aden, arrived after the text was in type. One represents two ewes of the Bedouin or Arabian long-tailed breed (p. 186) from

the Aden district, and exhibits the peculiarly narrow, horizontal ears, which look as though they had been bitten in infancy. In some cases they are rudimentary; and their general appearance indicates the affinity of this breed to the Levantine fat-tail (p. 180). The Aden representatives of the Bedouin sheep seem to be generally either wholly white or wholly black.

The second photograph shows a ram and ewe of a shaggy-woolled sheep from Basra, on the Persian Gulf, which I take to be the Persian dumba, although the hind-quarters are not shown. The ram has four horns, of the general type of those of four-horned Hebridean rams; a feature not recorded in the text in connection with fat-tailed sheep.

R. LYDEKKER.

HARPEDEN LODGE, HERTS,
July 25, 1912.

CONTENTS

CHAP.		PAGE
I.	The Early History and Names of the Sheep	1
II.	The Zoological Position and Structure of the Sheep	8
III.	The Mouflon, or Wild Sheep of Europe, and its Forerunners	46
IV.	The Short-tailed European Breeds	57
V.	The Medium-tailed British Breeds	78
VI.	Medium-tailed Continental and Mediterranean Breeds	121
VII.	The Turbary or Bündner Sheep	144
VIII.	Breeds of the Asiatic Highlands and China	154
IX.	Fat-tailed and Long-tailed Sheep	168
X.	Fat-rumped Sheep	193
XI.	Some Peculiar African Breeds	212
XII.	The Diffusion of Domesticated Sheep	245
XIII.	Typical Wild Sheep of Asia and America	252
XIV.	Aberrant Wild Sheep	301
XV.	Some Extinct Sheep	308

ILLUSTRATIONS

PLATES

PLATE

I. Fig. 1. Head of Mouflon Ram with Normal Horns . . . . . *Frontispiece*

Fig. 2. Head of Mouflon Ram with Abnormal (perverted) Horns . . . . . ,,

(*From photographs by* Mr. G. Stallard)

FACING PAGE

II. Fig. 1. A Mouflon Ram 46

(*From a photograph lent by the New York Zoological Society*)

Fig. 2. A Soa Ram . . . . . ,,

(*From a photograph lent by* Prof. J. C. Ewart)

III. Fig. 1. Head of Hebridean Ram in the Collection of Sir Basil Brooke, Bart. . . . 57

(*From a photograph lent by* Mr. Rowland Ward)

Fig. 2. Hebridean Ram from South Uist . ,,

(*From a photograph by* Mr. R. J. Cuninghame)

IV. Fig. 1. Black-faced Highland Ram . . . 78

Fig. 2. Welsh Mountain Ram . . . . ,,

(*Photographs by* C. Reid, *Witham*)

PLATE FACING PAGE

V. Fig. 1. Herdwick Ram 87

Fig. 2. Dorset Ram . . . . . „

(*Photographs by* C. Reid)

VI. Fig. 1. Southdown Ram 103

Fig. 2. Border Leicester Ram . . . . . „

(*Photographs by* C. Reid)

VII. Fig. 1. Merino Ram 121

Fig. 2. Rasko Ram and Ewe . . . . . „

VIII. Fig. 1. Manchega Ram 136

Fig. 2. Churra Ram . . . . . „

(*From photographs lent by the Royal Spanish Natural History Society*)

IX. Fig. 1. Wallachian or Zackel Ram . . 138

(*From "Guide to Domestic Animals," British Museum*)

Fig. 2. Hungarian Zackel Ram . . . „

X. Fig. 1. Bündner Sheep from Disentis . . 144

Fig. 2. Skull and Horns of Old Bündner Ram . . . . . „

(*Both figs. lent by* Dr. Keller)

XI. Fig. 1. Ancient Mycenean Rams, from a Tomb at Menidi 148

(*Block lent by* Dr. Keller)

Fig. 2. Head of Cyprian Red Ram. . . „

Fig. 3. Head of Barwal Ram . . . . „

(*From "The Field"*)

PLATE

FACING PAGE

XII. Fig. 1. Hunia Ewe and Ram 154

Fig. 2. Head of Cagi Ram . . . . ,,

Fig. 3. "Unicorn" Barwal Rams . . . ,,

(*All from photographs by* Col. J. Manners-Smith)

XIII. Fig. 1. Indian Dumba Ram 168

Fig. 2. Africander Fat-tailed Ram . . ,,

(*From "Guide to Domestic Animals," British Museum*)

XIV. Fig. 1. Somali Fat-rumped Ram . . . 193

(*From a photograph by* Dr. Drake-Brockman)

Fig. 2. Hedjaz Fat-rumped Sheep . . . ,,

(*From "Guide to Domestic Animals," British Museum*)

XV. Fig. 1. Egyptian Lop-eared Ram . . . 213

(*From a photograph by* Capt. S. S. Flower)

Fig. 2. Guinea Long-legged Ewe . . . ,,

XVI. Fig. 1. Head of Nigerian Long-legged Ram 224

Fig. 2. Nigerian Long-legged Ewe . . ,,

XVII. Fig. 1. Abyssinian Half-bred Long-legged and Maned Ram 232

(*From "Guide to Domestic Animals," British Museum*)

Fig. 2. Black Baluba Maned Ram . . ,,

PLATE FACING PAGE

XVIII. Fig. 1. Head of Four-horned Piebald Ram 238
(*From a photograph lent by* Col. H. Platt)

Fig. 2. Four-horned Piebald Rams . . ,,
(*From a photograph lent by* Mr. Heatley Noble)

XIX. Fig. 1. Head of Elburz Red Ram . . 253

Fig. 2. Cyprian Red Ram in Winter Coat . ,,
(*From a photograph lent by* Mr. Rowland Ward)

XX. Fig. 1. Skull and Horns of Baluchi Urial from Waziristan 258
(*From a photograph lent by* Mr. Rowland Ward)

Fig. 2. Skull and Horns of Kopet Dagh Urial . . . . . ,,

XXI. Fig. 1. Head of Mongolian Argali . . 270
(*From a photograph lent by* Mr. Rowland Ward)

Fig. 2. Head of Siberian Argali . . . ,,
("*Guide to Great Game Animals*," *British Museum*)

XXII. Fig. 1. Skull and Horns of Alatau Argali 276
(*From a photograph lent by* Sir E. G. Loder)

Fig. 2. Head of Kulja Argali . . . ,,

XXIII. Fig. 1. Head of White Alaskan Bighorn . 286
(*From* "*Bull. Amer. Mus. Nat. Hist*," 1897)

Fig. 2. Head of Sonoran Bighorn . . ,,
(*From a photograph lent by* Mr. I. N. Dracopoli)

XXIV. Fig. 1. Rocky Mountain Bighorn . . . 292

Fig. 2. Clifton's Bighorn . . . . ,,

TEXT-FIGURES

PAGE

STOMACH OF SHEEP 9
(*From "Guide to Great Game," British Museum*)

HEAD OF A "COMPOSITE" EGYPTIAN RAM . . . 16
(*After* PRISSE)

FOOT OF URIAL, TO SHOW GLANDS 18
(*From a sketch by* MR. POCOCK)

SKULL OF HORNLESS SHEEP 20

SYRIAN FAT-TAILED RAM 174
(*From Murray's Bible Dictionary*)

EGYPTIAN FAT-TAILED RAM 183
(*From* LORTET *and* GAILLARD, *Arch. Mus. Lyon*)

SKULL AND HORNS OF EGYPTIAN FAT-TAILED RAM . 185
(LORTET *and* GAILLARD, *op. cit.*)

SKULL AND HORNS OF FEZZAN LONG-LEGGED RAM . 218
(*After* GAILLARD)

ANCIENT EGYPTIAN LONG-LEGGED SHEEP . . . 227
(LORTET *and* GAILLARD, *op. cit.*)

SKULL AND HORNS OF KOPET DAGH URIAL . . . 266

SKULL AND HORNS OF PAMIR ARGALI 282

THE SHEEP AND ITS COUSINS

CHAPTER I

THE EARLY HISTORY AND NAMES OF THE SHEEP

The sheep, as typified by the domesticated breeds, to the European representatives of which Linnæus gave the name *Ovis aries*, was probably one of the earliest animals to be brought under subjugation by man. It is known, for instance, to have been domesticated by the inhabitants of the Prehistoric lake-dwellings, or Pfahlbauten, of Switzerland, by whom it appears to have been brought from the East: it is also depicted among the earliest of the Egyptian monuments, and its remains were mummified by the inhabitants of the Delta during the Pharaonic epoch, by which date, as detailed in a later chapter, there is evidence that two distinct breeds had already been differentiated. The Biblical record indicates the importance of sheep to the ancient Hebrews, and also teaches that

these animals—especially as represented by lambs—were regarded as the emblem of purity, innocence, and righteousness, while their near relative, the goat, occupied precisely the opposite position.

The ancient sheep referred to above were almost certainly of Eastern origin, and thus derived, in all probability, from one or more Asiatic wild species; but it is also quite probable that the Prehistoric inhabitants of Europe tamed the wild mouflon, which although now restricted to the islands of Sardinia and Corsica, in former times probably enjoyed a wider distribution. If this be so, European domesticated sheep represent a complex type, derived from at least two totally distinct wild sources.

Unlike some domesticated animals, the sheep possesses a distinct vernacular species-name of its own; that term being applicable to both sexes, and to the animal at all ages. As might have been expected, the word sheep has a very ancient origin, and is represented by allied terms in most of the Aryan languages. It is the equivalent, for instance, of the Anglo-Saxon *sceap* or *sceop*, of the Danish *schaap*, the German *schaf*, the Old German *scaf* and *awi*, the Lithuanian or Old Teutonic *awis* or *awiz*, the Latin *ovis*, and the Greek *oïs* (which becomes, by the introduction of the digamma, *ofis*), all of which are derived from the Sanskrit *avi*, a modification of the root *av*, signifying to keep or to guard.

Sheep accordingly means the animal that requires to be carefully tended or guarded, in opposition to cattle, which are better able to take care of themselves. It may be added that this Sanskrit origin of the name is of itself a proof that some at least of the domesticated sheep of Europe trace their ancestry to an Eastern source.

Here it may be mentioned as a somewhat remarkable fact that the Italian name for a sheep, instead of being derived from *ovis*, is *una pecora*, a derivative from the Latin *pecus*, plural *pecora*, signifying cattle generally. A very similar usage occurs in the case of the Greek *probaton*, generally employed in the plural, *probata*, which signifies any animal that walks with the head forwards, and then all kinds of cattle, as opposed to man. Later on, however, the name became restricted to sheep and goats, and in the Attic dialect almost exclusively to the former. In Hebrew the word *tzôn* is employed for sheep collectively, and *seh* for a single sheep or a goat.

As in the case of most domesticated animals, special names are assigned to the two sexes of the sheep, and likewise to the young.

For the adult male we have ram, which is common to English, Anglo-Saxon, and Friesian, and equivalent to the German *ramm;* while it is allied to the Old Norse and Icelandic *rammr* or *ramr* and the Swedish and Gothic *ram*, signifying

strong, and so to the Greek *romē*, strength. The ram is thus the strong, and so the butting animal; from which we have the verb to ram. The Latin *aries* is doubtless also from the same root; but the Hebrew *ayil* appears to be quite distinct.

Ewe, the name of the female of the sheep, comes from the Anglo-Saxon *eower*, the Old English *eowu*, the Friesian *ei*, and the Icelandic or Old Norse *â*, all of which are equivalent to the above-mentioned *awi*, *awis*, and *avi*, and thus primarily denote a sheep of either sex. The Middle Dutch *oie* or *eie* and the modern Dutch *ooi*, together with the Old High German *ouwe*, *au*, or *ou*, are akin. On the other hand, the Hebrew *rakhal* seems to be derived from a totally different root. The Swedish is *tacka*.

Lamb, a young sheep, is a word common, with slight difference of spelling in some cases, to English, Anglo-Saxon, Swedish, Icelandic, and Gothic, and is equivalent to the German *lamm* and the Old Teutonic *lamboz* or *lambiz*. That it is akin to the Greek *amnos*, the Latin *agnus*, the Italian *agnello*, and the French *agneau*, may be regarded as certain; but according to the *Century Dictionary* no sure extra-Teutonic affinities of the word have been found. Nevertheless, it has been suggested that lamb is connected with the Welsh *llam*, signifying a skip or frisk, which is itself apparently akin to the Hindi *lela*, a lamb, believed to be a derivative

from the Sanskrit *lal*, to be wanton, If this derivation be accepted, lamb is the frisking or sportive animal. An Old English plural was *lamben*.

The Hebrew *tale*, signifying a young unweaned lamb, comes apparently from a perfectly distinct root; and the same is the case with *kebes* (feminine *kebesa*), properly signifying a sheep of more than a year old, but generally translated lamb.

Wether, the term applied to the castrated male, is the equivalent of the Anglo-Saxon *wether* or *wedder*, the Danish *væder*, and the German *widder*, all of which denote the ram. The modern French term for wether is *mouton*, and the Old French *moton* or *molton*, probably from the Gaulish *multos*, which appears akin to the Welsh *mollt*, the Old Irish *molt*, the Cornish *mols*, and the Breton *maout*, all of which refer to the ram. It has been suggested that the Middle Latin *multonem*, or *mutilonem*, is the equivalent of the Latin *mutilus* and *mutilare*, so that *mouton*, from which, of course, is derived the English mutton, signifies the mutilated, and so the castrated animal. In reference to this, it is stated in the *Century Dictionary* that "it seems very unlikely that the Celtic forms are unconnected; if they are from popular Latin the adoption must have taken place at a very early period."

In this connection it is interesting to note that the borrowing from the French of a name for the flesh of an animal which retains in English its

Anglo-Saxon title in a slightly modified form is one among several instances of a similar practice which came into use after the Norman Conquest. This is illustrated by the following quotation from Sir Walter Scott's *Ivanhoe*:—

"'Why, how call you those grunting brutes running about on their four legs?' demanded Wamba.

"'Swine, fool, swine,' said the herd; 'every fool knows that.'

"'And swine is good Saxon,' said the jester; 'but how call you the sow when she is flayed, drawn, and quartered, and hung up by the heels like a traitor?'

"'Pork,' answered the swineherd.

"'I am very glad every fool knows that too,' said Wamba; 'and pork, I think, is good Norman-French; and so when the brute lives and is in charge of a Saxon slave, she goes by her Saxon name; but becomes a Norman, and is called pork, when she is carried to the castle-hall to feast among the nobles; what does thou think of this, friend Gurth, ha?'

"'It is but too true doctrine, friend Wamba, however it got into thy fool's pate.'

"'Nay, I can tell you more,' said Wamba in the same tone; 'there is old Alderman Ox continues to hold his Saxon epithet while he is under the charge of serfs and bondsmen such as thou, but

becomes Beef, a fiery French gallant, when he arrives before the worshipful jaws that are destined to consume him. Mynheer Calf, too, becomes Monsieur de Veau in the like manner; he is Saxon when he requires tendance, and takes a Norman name when he becomes a matter of enjoyment.'"

Several terms are applied by farmers and breeders to immature sheep of various ages, among which it must suffice to refer to *teg*, *tag*, *tegg*, or *tagge*, a name of uncertain origin, but perhaps connected with the Swedish *tacka*, a ewe. It indicates a sheep in its second year, or from the time it is weaned till its first shearing, or, in other words, a yearling sheep. Although formerly restricted to the female, it is now applied to both sexes, so that we have ewe and wether tegs. Hog, or hogget, is an equivalent term.

Lastly, we have the French *bélier*, a ram, and *brebis*, a ewe, or a sheep generally, which appear to be unconnected with any of the foregoing terms.

CHAPTER II

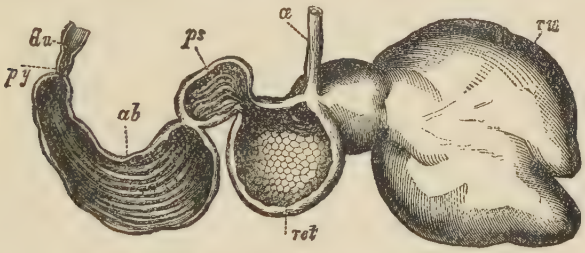
THE ZOOLOGICAL POSITION AND STRUCTURE OF THE SHEEP

The sheep is a member of that group or family of ruminants typified by the ox (*Bos*), and hence termed the *Bovidæ* or ox-like family. It represents, however, in that family a perfectly distinct genus, for which Linnæus adopted the Latin name *Ovis*.[1] Of that genus the domesticated sheep of Europe, the *Ovis aries* of Linnæus, constitutes the typical, but by no means the only, species; for there are several kinds of wild sheep, some of which differ so markedly from tame sheep and their nearest relatives, as to be regarded by many naturalists as the representatives of distinct genera.

In addition to cattle, or oxen, goats, and sheep, the family *Bovidæ* includes antelopes, chamois, musk-oxen, &c., all of which possess the common character that the horns take the form of hollow horny sheaths surmounting conical or compressed

[1] As the meanings attached by naturalists to the terms "family," "genus," "species," &c., are fully explained in my work on *The Ox and Its Kindred* (1912), to which the present volume forms a companion, they need not be repeated. It will also be unnecessary to give the full characters of the larger groups of which the *Bovidæ* form a section.

processes arising from the frontal bones of the skull. The *Bovidæ* are further characterised by the absence of upper front teeth, or incisors, the place of which is taken by a hard callous pad, against which bite the three pairs of lower incisors and the single pair of lower canines, or tusks, which collectively form a semicircular series of four pairs of similar teeth. This peculiarity is correlated with



Stomach of a Sheep, partially cut open to show Internal Structure

œ, œsophagus, or gullet ; *ru*, rumen, or paunch ; *ret*, reticulum, or honeycomb ; *ps*, psalterium, or manyplies ; *ab*, abomasum ; *py*, pylorus ; *du*, duodenum, or commencement of the small intestine.

a characteristic structure of the cheek-teeth, the last three pairs of which, technically known as molars, carry on their crowns four columns ; the two innermost of these in the upper jaw and the two outer in the lower, having a distinctly crescent-like form, whence this type of dentition is known as selenodont, from the Greek *selenē*, the crescent moon, and *odous* (genetive *odontos*), a tooth. But this is by no means all, for this very remarkable

type of dentition is associated with the power of "chewing the cud," or ruminating, which is rendered possible by the complex structure of the stomach, as shown in the accompanying woodcut, where the names applied to the different compartments of this organ are indicated. A further distinctive feature is to be found in the circumstance that the shank of the leg is formed by a single bone carrying at its lower end a pair of pulley-like surfaces to which are articulated the bones supporting the two main hoofs. It should be added that this shank-bone, or cannon-bone, as it is generally termed by naturalists, really consists of two separate bones which have been joined together; and also that the two main hoofs are symmetrical to a line drawn between them, thereby constituting the so-called cloven hoof of popular language.

But these features are by no means restricted to the members of the *Bovidæ*, as they recur in the American prongbuck, constituting the family *Antilocapridæ*, in giraffes and okapis (*Giraffidæ*), and the deer tribe (*Cervidæ*). Consequently, all these four families are regarded as forming a single larger group or section, popularly known as ruminants, but by naturalists generally termed the Pecora, or cattle-like animals.

It may be well to add that the ruminating function is evidently designed to enable the animals

in which it is present to gather their food with the greatest possible rapidity in the open, and then to retire to a less exposed position for the purpose of thoroughly masticating it at leisure.

True ruminants, in common with camels, llamas, and chevrotains, which also ruminate but are distinguished by various structural peculiarities, and pigs and hippopotamuses, which have not that power, collectively constitute the Artiodactyla or even-toed group of the great order of Ungulata or hoofed animals. As a comparatively full account of the features distinguishing the Artiodactyla or even-toed section from the Perissodactyla or odd-toed section (tapirs, rhinoceroses, and horses) is given in *The Ox and Its Kindred*,[1] it must suffice to mention that whereas in the former the two toes corresponding to the third and fourth digits of the human hand and foot are symmetrical to a vertical line between them, in the latter the toe representing the human third digit (which in the modern horse-group is the only one remaining) is symmetrical in itself, and larger than those on its two sides, when these are present. For the distinctive features of the Ungulata or hoofed mammals, the reader may consult the volume already quoted.

The following table exhibits at a glance the position occupied in the zoological scheme by

[1] In the first four lines of page 11 of this work, the terms "even-toed" and "odd-toed" are unfortunately transposed.

domesticated sheep and some of their wild relatives :—

Subkingdom VERTEBRATA—Vertebrates, or Back-boned Animals.
Class MAMMALIA—Mammals.
Order UNGULATA—Hoofed Mammals, or Ungulates.
Suborder ARTIODACTYLA—Even-toed Ungulates.
Section PECORA—Typical Ruminants.
Family BOVIDÆ—Hollow-horned Ruminants.
Subfamily CAPRINÆ—Sheep and Goats.
Genus OVIS—Sheep.
Species 1.—*Ovis aries*, the Domesticated Sheep.
Species 2.—*Ovis musimon*, the Mouflon, or European Wild Sheep.
Species 3.—*Ovis orientalis*, the Red Sheep, or Wild Sheep of South-eastern Asia.
&c., &c.

Having now cleared the ground, attention may be directed to the features by which sheep are distinguished from oxen, or cattle, the typical representatives of the family *Bovidæ*. In the first place, sheep as a whole are smaller animals than oxen, although the largest sheep, such as the Central Asian argali, is considerably bigger than the anoa or dwarf buffalo of Celebes, the smallest member of the ox group. Then, again, they usually carry their heads higher, and considerably elevated above the line of the back. In place, too, of the broad, naked, moist, undivided muzzle of the oxen, sheep have a vertically cleft, narrow snout com-

pletely covered with short hair, except on the margins of the nostrils and lips. Very generally there is a small suborbital face-gland, situated in a shallow depression in the lachrymal bone of the skull (see figure on p. 20), and frequently known as the tear-gland, or larmier. Sheep also differ from living oxen in that when horns are developed in the females, as is usually the case among the wild species, they are very much smaller than those of the males, from which they generally also differ considerably in shape.

In the more typical species and breeds the horns of the rams are of a massive type, curving forwards along the sides of the face in a subcircular spiral coil, the whole horn being in fact coiled round a central axis in somewhat the fashion of a snail-shell. This type of horn is represented in the Egyptian frescoes of the sheep-headed god *Ammon* or *Amon*, so that it may be conveniently known as the Ammon type (see figure on p. 16). In tranverse section these horns are more or less distinctly triangular, and their front and lateral surfaces are marked by a number of parallel transverse ridges, which in old rams become very closely approximated as their origin from the skull is approached. In colour the horns of the more typical sheep are oak-brown, but in some of the aberrant species and breeds they are olive, or even black.

In sheep with horns of the Ammon type—or

mouflon type, as it may be otherwise called—the right horn forms a right-handed spiral and the left horn a left-handed spiral; this condition being called homonymous, as opposed to heteronymous, in which the right horn forms a left-handed spiral, and *vice versâ*. This heteronymous condition is displayed by antelopes and wild goats (especially the Himalayan markhor); but, curiously enough, tame goats, with the exception of the Circassian breed, have horns with the spiral running in the same direction as in sheep, that is to say, they are of the homonymous type.[1] It may be added that there are certain extinct European antelopes, constituting the genus *Oioceros*, in which the spiral is homonymous, as in sheep.[2]

As the subject of spirals is a somewhat difficult one, it may be well to mention that an ordinary screw or a corkscrew represents a right-handed spiral. In following the ridge on such a right-handed spiral we pass continuously to the left; and this has led some Continental writers[3] to describe the Ammon or mouflon type of horn as a left-handed spiral, which is incorrect.

[1] See G. Wherry, "On the Direction of the Spiral in the Horns of Ruminants," *British Medical Journal*, September 27, 1902; T. A. Cook, *Spirals in Nature and Art*, London, 1903, p. 77, and "The Spirals of Horns," *Field*, July 27, 1912.

[2] See C. Gaillard, "Le Bélier de Mendés," *Bull. Soc. Anthrop. Lyon*, 1901, p. 24.

[3] Gaillard, *op. cit.*, and Fitzinger, *Sitzber. Ak. Wiss. Wien*, vol. xxxviii. p. 156, 1859.

The Ammon type is, however, by no means the only one found in sheep, for in the African long-legged breeds, as shown in the text-figures in chapter xi. and in pl. xvi. fig. 1, the horns are, so to speak, pulled out or stretched, so as to lose almost completely the snail-like curve, and to be twisted on their own axis. In this breed the direction of the horns is almost immediately outwards, but in the Wallachian sheep, or zackel-sheep (pl. ix. fig. 1), the horns are directed obliquely upwards and outwards, and the twisting on their own axis in screw-style is still more marked. In all these cases the spiral is of the homonymous type, that is to say, the right horn forms a right-handed spiral.[1] We thus have a complete gradation from what Mr. Theodore Cook[2] terms the curved type, as exemplified by ordinary sheep, to the twisted type, as shown in the markhor among goats and in the bushbuck and kudu among antelopes.

The coexistence of the two types in sheep is remarkably well exemplified by an ancient Egyptian fresco (1449–1423 B.C.) reproduced in the accompanying illustration,[3] which is evidently a composite

[1] Mr. Cook, *Spirals in Nature*, regarded the horns of the Wallachian sheep as of the heteronymous type.

[2] *Loc. cit.*

[3] This figure was tentatively regarded by Dr. A. E. Shipley, *Country Life*, March 23, 1912, p. 426, as that of a four-horned ram.

formed by adding to a ram with horns of the Ammon type a pair of horns of the old Egyptian long-horned breed already referred to.

This, however, does not by any means exhaust the variation displayed by the horns of sheep. Dr. Fitzinger, in the passage already cited, pointed out that the curvature of the horns of the red

Head of a "Composite" Ram, from an Ancient Egyptian Monument, 1449–1423 B.C. (After Prisse.)

sheep, or Gmelin's sheep (*Ovis orientalis*) of Cyprus, Asia Minor, and Persia, differs from that of the mouflon, and he considered that the spiral runs in the reverse direction to that which obtains in the latter. In this he was followed by Mr. Wherry, who regarded the horns of the red sheep as heteronymous in place of homonymous.

In reality the horns of the red sheep have the

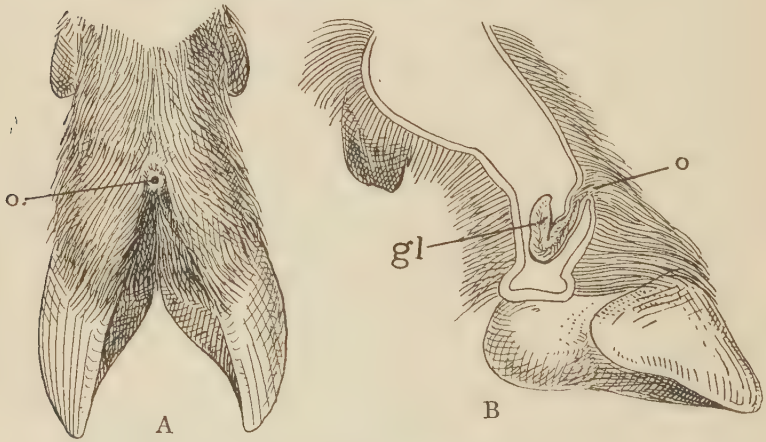
same (homonymous) spiral as those of the mouflon, but the curves are somewhat differently arranged, the tips of the horns, owing to a change in direction, forming the summits of downward, in place of upward, spirals (compare pl. i. fig. 1 with pl. xi. fig. 2). This change in the direction of the tips of the spirals, which is repeated among the sheep in the North African arui (*Ammotragus lervia*) and the Tibetan bharal (*Pseudoïs nahura*), and among the goats in Pallas's tur (*Capra cylindricornis*) of the Caucasus, is technically known as a mathematical perversion, and causes the horns to bend backwards behind the neck, instead of coming forwards by the sides of the face.

From this it will be evident that all sheep, both wild and tame, have horns of the homonymous type.

Reverting to the consideration of the structural differences between sheep and oxen, it remains to point out that whereas all the latter are long-tailed animals, every species of wild sheep, save the aberrant African arui, has a short tail, only slightly exceeding in length that of an ordinary deer. A similar or nearly similar condition obtains in several of the more primitive breeds of domesticated sheep, although, on the other hand, in the majority of such breeds the tail becomes more or less markedly elongated, or undergoes abnormal development in other ways; all such departures from the wild type

of tail being, like the tendency to droop in the ears, evidently due to the effects of domestication.

That all the more typical sheep have suborbital face-glands has been already mentioned, and it remains to add that they display a further difference from oxen in the presence of glands in the groin and between the two main toes of the feet. Of



Front View of Foot with the Hoofs expanded (*A*) of the Urial, and longitudinal section of the same (*B*). *o*, orifice of gland; *gl*, gland.

these foot-glands in one of the Asiatic wild sheep, Mr. R. I. Pocock, to whom I am indebted for the accompanying illustration, writes as follows:[1]—

"The pedal gland opens by a small circular orifice (*o*) near the summit of the triangular depression on the front of the pastern, some distance

[1] "On the Cutaneous Scent-glands of Ruminants," *Proc. Zool. Soc. London*, 1910, p. 859.

above the hoofs. The orifice leads into a narrow duct which quickly but gradually expands into the gland. The latter descends along the interungual integument [*i.e.* the skin between the hoofs] towards the heel, then turns sharply upwards and backwards upon itself for a short distance along the integument of the back of the pastern.

"The gland is lined with short hairs, and the secretion is a clear semi-fluid substance with a pleasant scent like toffee, slightly infused with acetic acid."

The secretion of these foot-glands, by scenting the ground or herbage over which sheep have passed, aids, doubtless, in enabling the members of a scattered flock to ascertain the whereabouts of their fellows. The unpleasant smell of domesticated sheep, so different to the sweet aroma of cattle and many kinds of antelopes, may be in part due to the secretion of these glands.

Sheep also differ from cattle in that there are usually only two (in place of four) teats to the udders of the ewes, although occasionally a supplemental pair may be developed.

The skull of a sheep differs markedly from that of an ox in the much greater degree in which the face is bent down at an angle to the portion enclosing the brain, thereby giving rise to a prominent ridge above the sockets of the eyes, from either side of which the planes of the parietal *(p)* and frontal

(f) regions slope away in opposite directions at an obtuse or a right angle. If, as has been suggested, this bending-down of the fore part of the skull in a large number of grazing ruminants is to a great extent brought about by the "pull" exerted on the bones by the action of plucking the tufts of grass, it will be manifest that the effect will be

Side View of Skull of a Hornless Domesticated Sheep. *f*, frontal ; *n*, nasal ; *l*, lachrymal ; *p*, parietal ; *pm*, premaxilla.

greater in the case of a small and narrow skull like that of a sheep than in the case of the broad and stout cranium of an ox. And here it may be mentioned that, owing to the small size of its muzzle, a sheep can graze much closer than an ox, and can, in fact, thrive on pasture where the latter would absolutely starve. A horse occupies in this respect an intermediate position between an ox and

a sheep, its possession of nipping incisor teeth in both upper and lower jaws enabling it to graze closer than the former, in which the upper incisors are absent, although its larger muzzle prevents it from equalling the latter in the closeness of its bite.

Here also it may be mentioned that the skulls of tame sheep differ from those of their wild relatives—when specimens with the same approximate basal length are compared together—by the smaller diameter of the socket of the eye, the abortion of the auditory bulla at the base of the skull, and the much smaller capacity of the brain-chamber. It has been shown, for instance,[1] that whereas in the wild mouflon the brain-capacity ranges from 130 to 170 cubic centimetres, with a mean of 140 cubic centimetres, in domesticated sheep skulls of the same average size the mean brain-capacity is only from 110 to 120 cubic centimetres. These differences are due, of course, to the more or less protected conditions under which domesticated sheep pass their existence, thereby reducing the need of acuteness in the senses of hearing, sight, and smell.

The skulls of horned sheep differ from those of the more typical kinds of cattle by the more forward position of the bases of the cores of the horns on the frontal bones; but there is a minor difference in this respect in the case of bison and buffaloes.

[1] See Klatt, *Sitzber. Ges. natfor. Freunde, Berlin*, 1912, p. 153.

A very important distinction between cattle and sheep is to be found in the structure of the upper molar teeth, that is to say, the last three pairs of teeth of the check-series. In cattle these teeth form squared prismatic pillars, with an additional column between the two crescents on the inner side, and a large amount of cement on the outer surface. In sheep, on the other hand, these teeth are narrower and less elevated, with no additional column on the inner side, and a smaller amount of cement on the outer surface.

In common with the great majority of true ruminants, adult sheep possess 32 functional teeth, which are classed as follows: Incisors $\frac{0}{3}$, canines $\frac{0}{1}$, premolars $\frac{3}{3}$, molars $\frac{3}{3} = 32$. These are preceded by a smaller series of deciduous or milk teeth, which may be formulated as *mi.* $\frac{0}{3}$, *mc.* $\frac{0}{1}$, *mm.* $\frac{3}{3} = 20$. The whole of these twenty deciduous teeth have cut the gums by the time the lamb is three or four weeks old. At the sixth month the first of the permanent molars makes its appearance behind the last milk-molar in both the upper and lower jaws; and at the end of the second year the second permanent molar has also come into use in both jaws, so that there are then five pairs of cheek-teeth, namely three deciduous and two permanent molars both above and below. In order to distinguish between this stage of development and older sheep in which the anterior premolar may have been shed

(thereby reducing the number of cheek-teeth from six to five), it may be noted that the third lower tooth in the earlier stage consists of three distinct lobes, whereas in the later condition the corresponding tooth is composed of one main lobe, with a supplemental lobule on the posterior side.

As regards the front teeth of the lower jaw, the first or innermost pair of milk-incisors are shed during the second year and replaced by the permanent ones, easily recognised by their much broader crowns: it was when in this condition that the sheep was described by classical Roman authors as *bidens*, that is to say, two-toothed. It will be noticed that at this stage the first pair of permanent lower incisors and the first and second pairs of permanent molars are in place simultaneously with the second and third pairs of deciduous lower incisors, the deciduous lower canine, and the three pairs of deciduous or milk molars of both jaws.

Towards the close of the second year the third or last pair of permanent molars cuts the gums both above and below; while at the same time the deciduous milk-molars begin to be replaced by the permanent premolars, falling at short but irregular intervals, and in such a manner that the last of the series may be shed a week or so earlier than the two in front of it. This replacement of the cheek-teeth is generally, if not invari-

ably, completed by the end of the second year, although the change of the front teeth is not finished till considerably later.

The second pair of permanent lower incisors, for instance, pushes out the corresponding deciduous teeth during the third year, while the third or outermost pair usually comes into place during the first half of the fourth year, but the permanent lower canines are not in use until the fifth year; their appearance indicating the completion of the adult dentition. It should be added that the last pair of molars in each jaw (of which the lower pair consists of three-lobed teeth like the last lower milk-molars) begin to develop roots at the base of their crowns during the fourth year, after which they cease to grow; the same development having taken place in the first and second pairs at an earlier date.

Wild sheep of all kinds are clothed with a hairy coat comparable to that of cattle and antelopes, but at the base of this fur there may be more or less marked traces of a soft under-fur, which is much more developed in some kinds of wild goats; this being known in Tibet and Kashmir as *pashm*. Many tropical breeds of domesticated sheep retain a hairy coat comparable to that of the wild sheep; but in other breeds, especially those inhabiting temperate and cold climates, this is more or less completely re-

placed by wool, except on the face, ears, and legs, where the hair is generally retained, although in some breeds, such as the merino and the Shropshire, wool is developed on the face and legs.

It has been very generally stated that wool results from an ultra-development of the underfur, accompanied by disappearance of the hair. This, however, was long ago disputed by Professor Thomas Bell, who observed[1] that "the longer hairs of the mouflon are in their structure as definitely wool as that of the [domesticated] sheep: they are coarse and stiff, it is true, and nearly straight; but they possess the essential character of wool, in the imbricated scaly surface, which gives to wool that remarkable felting property upon which its peculiar utility, in many cases, depends. It is also somewhat waved; and it requires no considerable change to convert such a filament as this into one of fine curly wool. On the contrary, the short soft pelt which lies at the root of this is nothing more than extremely fine hair, uniform and smooth over its whole surface, and not assuming the slightest appearance of the woolly texture. I have examined the two kinds of hair of the mouflon from various parts of the animal, and have found no essential variation."

At a later date Sir Richard Owen[2] wrote, in

[1] *British Quadrupeds*, 1st ed., p. 438, London, 1837.
[2] *Anatomy of Vertebrates*, vol. iii. p. 618, London, 1868.

somewhat less definite terms, apparently to much the same purpose, as follows :—

"The term 'wool' is commonly understood to mean the modified hairs of domesticated breeds of sheep which, through a finely intricate arrangement of superficially serrated scales, and a curly disposition, have the property of 'felting,' on which depends the value of the wool in manufactures. The property is present in a minor degree in the longer, straighter, scantier fleece of such wild sheep as the Himalayan *Ovis vignei*, the *Ovis ammon* of Central Asia, and the *Ovis musimon* of Sardinia. In the domesticated races the fleece has been modified and improved in various degrees by crossing the breeds, by choice of climate and pasture, and by careful attention and defence during its growth, until not only has the original coarse character of the product disappeared, but qualities of wool of different kinds and of different degrees of superiority have been obtained, generally divisible into two classes, one better adapted for 'carding,' the other for 'combing,' and both available for a great variety of useful and elegant textile fabrics."

This replacement of the hair by wool, together with the lengthening or other abnormal development of the tail, and the frequent elimination of the horns, are some of the most striking modifications which have been produced in sheep as the result of domestication.

Sheep are mainly an Old World group, of which the headquarters would appear to have been Central Asia, whence some of them made their way by way of what is now Bering Strait, into North America, where they range so far south as Mexico. One wild species still inhabits Sardinia and Corsica, and appears to have formerly enjoyed a more extensive distribution in the south of Europe Another is found in Cyprus, Asia Minor, and Persia, while several are natives of the Himalaya and Central and North-eastern Asia, including Kamchatka. One of these Asiatic species extends into the Punjab Salt Range, but none is known to the southward of this, or in the countries to the east of the Bay of Bengal. The only wild sheep inhabiting Africa is the aberrant arui of the Atlas and the desert from the south of Biskra in the west to Kordofan in the east.

Although essentially mountain-animals, sheep in the wild state do not as a rule frequent such rugged and precipitous ground as their near relatives goats, but prefer more open country, their largest representatives, the argalis of Central Asia, being natives of the open rolling Pamirs, and the somewhat similar country of the Altai, the Changchemo district of Tibet, and parts of Mongolia. In some of these districts wild sheep are found at very great elevations.

Although typical sheep differ markedly from

typical goats, the two groups are closely connected by intermediate species, and some of the domesticated breeds of sheep are so goat-like in appearance that it is often a matter of difficulty to determine to which genus they belong. In all goats, so far as is known, the males carry a beard on the chin, and exhale the well-known powerful "goaty" odour; whereas these of sheep lack both these attributes. The males of most species of wild goats differ, as we have already seen (page 14), from those of sheep by the spiral of the horns being twisted in the opposite direction; but this character fails to distinguish between the two groups, because, as is likewise mentioned in the passage cited, Pallas's tur of the Caucasus, which carries a tuft on the chin and is classed as a goat, has the same turn of horn as in the red sheep and the blue sheep or bharal. Neither can a hard and fast line be drawn from the presence or absence of face-glands and foot-glands. In the more typical sheep, as already stated, these glands are fully developed, although those of the face tend to become small in the big-horn sheep of Kamchatka and North America. In the North African arui or Barbary sheep glands are, however, absent from the face and the feet; while the bharal has likewise no face-glands, and, at the most, small and apparently functionless rudiments of the foot-glands.[1] Goats also lack the face-

[1] See Pocock, *Proc. Zool. Soc. London*, 1910, pp. 862 and 863.

glands and glands in the hind-feet, but may retain small glands in the fore-feet, although these are frequently absent.[1]

The ears may become pendent in domesticated breeds of both sheep and goats, and this may be accompanied by the abortion or loss of the horns; but no goat grows a tail equal in length to that of many breeds of domesticated sheep, although in some tame goats this appendage loses the short and frequently cocked character distinctive of the wild species.

Certain differences distinguish the skulls of the more typical sheep from those of the more typical goats; and Sir Richard Owen[2] has recorded a number of osteological characters which he regarded as differentiating the skulls of domesticated English sheep from those of domesticated goats, but several of these do not appear to hold good when other breeds and species are taken into consideration.

Generally speaking, it may be stated that in sheep the skull (see figure on page 20) is broadest across the sockets of the eyes, which are prominent, and then narrows rapidly in front of them; while the planes of the occiput (including the parietal region) and the forehead meet one another at little more than a right angle. The portion of the skull

[1] See Pocock, *Proc. Zool. Soc. London*, p. 864.

[2] *Anatomy of Vertebrates*, vol. ii. p. 475, London, 1866.

behind this angle is much shorter than the part in front; the occipital plane is flattened; and the profile of the face is more or less markedly convex, this feature attaining its maximum development in some of the domesticated breeds.

In goats, on the other hand, the occipital and frontal planes meet at a more obtuse angle,[1] the occipital and parietal area is saddle-shaped, the portions of the skull behind and in front of this angle are more nearly equal in length, and the profile of the face is concave. In some goat-skulls there is an unossified space in the neighbourhood of the lachrymal (see figure of sheep's skull on p. 20), but this is not constant for all the species, and tends to become obliterated with age.

As already mentioned, in the majority of the species of wild goats the spiral of the horns is in the reverse direction to that characteristic of sheep; and it may be added that the horns of the typical wild goat, the various species of ibex, and the markhor differ very decidedly in form from those of the more typical sheep. On the other hand, as has likewise been noticed above, the horns of the aberrant blue sheep or bharal of Tibet are essentially similar in direction and form to those of Pallas's tur of the Caucasus, which is an aberrant goat.

[1] See Blanford, *Fauna of British India, Mammalia*, pp. 493, 508. Owen, *loc. cit.*, states that sheep have the larger angle.

It is thus abundantly clear that sheep and goats are closely related animals; and it is a question whether they might not all be included in the single genus *Capra*. On the other hand, it is now considered that it helps matters to make the arui sheep of North Africa and the Tibetan bharal the representatives of separate genera, occupying an intermediate position between typical sheep on the one hand and goats on the other.

The intimate relationship between sheep and goats will be intensified if it be true that some at least of the domesticated breeds of the two groups will interbreed and produce fertile offspring. Dr. L. J. Fitzinger[1] states, for instance, that in many parts of northern Russia domesticated sheep of the short-tailed and frequently four-horned breed are commonly crossed with goats, and that the resulting progeny are in the main perfectly fertile, although it is not mentioned whether this means *inter se*, or with one or both of the parents. Although this also is not stated in so many words, it would likewise appear from the context that these alleged hybrids are the product of crossing male goats with female sheep. They are stated to resemble their dams in all respects, with the exception that the wool is firmer and stiffer.

Dr. Fitzinger, as is fully mentioned later, was also of opinion that many of the more goat-like

[1] *Sitzber. Ac. Wiss. Wien*, vol. xxxviii. p. 201, 1859.

breeds of domesticated sheep are hybrids, although his views are not shared by others.

In Chile and Peru sheep and goat hybrids are commonly believed to have been bred since comparatively early times; such alleged hybrids being known in Spanish as *cabranos* and in French as *chabins*; the term *pellories* being applied to the second and third generations of these hybrids.

An important and interesting review of the opinions entertained by naturalists regarding these chabins of the mountain pastures of the Chilian Cordillera is included by Messrs. Neveu-Lemaire and Grandidier in an article on the mammals of the Cordilleran Plateau contributed to the Report of the *Mission Scientifique* of G. de Créqui Montfort and E. S. de la Grange, recently published in Paris. Of this I have given the following summary in the *Field* of June 15, 1912, which by the editor's courtesy I am enabled to reproduce:—

"Of these animals living specimens are exhibited at the present time in the Jardin d'Acclimatation, Paris, and others in the Zoological Gardens at Santiago de Chile. In the character of their fleece these chabins conform more to the goat than to the sheep type, and they certainly indicate a distinct breed; but whether this breed has been produced by crossing ewes with he-goats is the question at issue.

"More than a century ago Buffon stated that

goats and sheep would interbreed, although he had no information whether the hybrids were fertile; and recently another writer, Mr. Krauts (*Revue des Sciences Naturelles Appliquées*, Paris, 1891, p. 71), has definitely recorded the birth of hybrids between goats and ewes. Again, so long ago as 1782, Molina, in his *Saggio sulla Storia Naturale del Chile* (p. 332), stated that 'the natives of the Cordillera, by coupling the goat with the ewe, have created an intermediate race. Its size is double that of the ewe; its fleece is formed of very long hairs as supple as those of the Angora goat, a trifle wavy, and very similar to wool.' Molina was followed by Claude Gay, who wrote in his *Historia de Chile, Agricultura* (vol. i. p. 465), that 'this absolutely hybrid race is derived from the goat and the ewe. . . . What is more singular than its origin is the fact that it is fertile, reproducing itself to the third and fourth generation, or even indefinitely, that is to say, at certain elevations.'

"In neither of these accounts, it will be noticed, is there any direct first-hand evidence as to the hybrid origin of the chabins. And their reputed cross-bred character is definitely denied by Mr. Ferdinand Lataste (*Actes Scientifiques du Chili*, vol. i. p. 2, 1891), who spent some years in Santiago as director of the museum, and who asks why, if such a phenomenon is so common in Chile, it is unknown in Europe. In this incredulity Lataste

was preceded by the German naturalist Nathusius, who wrote that the skeleton and soft parts of the chabin are identical with those of the sheep, and quite unlike those of the goat. The figure of the skull and horns of a chabin given by him and reproduced by Messrs. Neveu-Lemaire and Grandidier is, indeed, essentially that of a sheep.

"A few years later a very similar opinion was expressed by another French writer, who wrote as follows in the *Comptes Rendus de l'Académie des Sciences, Paris* (vol. cxxiii. p. 322, 1896): 'From an anatomical point of view the chabins are very long-woolled sheep. They breed freely with sheep, both male and female, the progeny being always lambs. If the ewes are left with a he-goat there is a *rapprochement*, but without results. The hybrid origin of the chabins is, then, a fable, like that of the so-called "leporides;" they form a breed of sheep, just as the "leporides" form a breed of rabbits, and nothing more.'

"This very definite opinion, in view of what has been recorded with regard to the crossing of sheep and goats in Europe, is, however, not fully accepted by Messrs. Neveu-Lemaire and Grandidier, who sum up their article as follows: 'In conclusion, without desiring to deny the possibility of a union between the two species, sheep and goats, we are of opinion that the modern chabins of Chile are not exclusively the fertile products of a first cross be-

tween the goat and the ewe, but that they are the results of numerous crossings, among which sheep have played the predominant part; this being equivalent to saying that chabins are not hybrids, but a special breed of sheep. It would, indeed, seem that where the Chilian shepherds are desirous of improving the quality of the fleeces of their flocks they introduce, after about two or three generations, a fresh strain of ram-blood by crossing the male chabins with their ewes.

"'If it is required to define chabins we should say that they form a special breed of sheep, into which has been introduced from time to time a strain of goat, which does not, however, prevent them from continually reverting to the ovine type in the most evident manner. The chabin, then, cannot be regarded as an intermediate type between sheep and goats.'

"This I regard as a somewhat lame and impotent conclusion. Chabins are either hybrids or they are not; if they have any—even the slightest—strain of caprine blood, they are hybrids, and therefore to a certain extent intermediate between their respective parents."

If interbreeding really exist—and that it does at least occasionally occur seems certain, it is, of course, a strong argument in favour of the view that sheep and goats should be included in one and the same genus; and if the principle inculcated in

my volumes on *The Ox and Its Kindred* and *The Horse and Its Relatives* were strictly adhered to, this course would have to be adopted. Since, however, it seems inadvisable to interfere more than is absolutely essential with generally accepted systems of classification, the more typical sheep are here separated from the goats (*Capra*) as *Ovis*, while the aberrant arui and bharal are assigned to genera by themselves.

As the various modifications produced in sheep by domestication are more or less fully described in the sequel, they need not be referred to in detail in this place. Many at least of these modifications would appear to be the result of accumulated slight changes produced by the influence of climate, soil, food, &c. The fat-rumped character, for instance, seems to be intimately connected with a dry climate and saline soil, accompanied by aromatic and saline plants as food; for when removed from such surroundings fat-rumped sheep tend to lose in greater or less degree the feature from which they derive their name.

On the other hand, there is evidence that breeds may occasionally be produced by sudden mutations, as is exemplified by a well-known case quoted by Darwin,[1] who wrote as follows:—

"Thus, in 1791, a ram-lamb was born in Massa-

[1] *Animals ana Plants under Domestication*, vol. i. p. 104, 2nd ed., London, 1885.

chusetts, having short crooked legs and a long back, like a turnspit-dog. From this one lamb the *otter* or *ancon* semi-monstrous breed was raised; as these sheep could not leap over the fences, it was thought that they would be valuable; but they have been supplanted by merinos, and thus exterminated. The sheep are remarkable from transmitting their character so truly that Colonel Humphreys[1] never heard of 'but one questionable case' of an ancon ram and ewe not producing ancon offspring. When they are crossed with other breeds the offspring, with rare exceptions, instead of being intermediate in character, perfectly resemble either parent; even one of twins has resembled one parent and the second the other."

In this account, which is taken from the *Transactions of the Royal Society* for 1813, Darwin refers to the ancon breed as having been produced from a single lamb. There is, however, another account of the ancon sheep which appears to be fuller and more explicit than any other. It occurs in the third volume (p. 134) of T. Dwight's *Travels in New England and New York*, published at New Haven, Conn., in 1822, the journey to which it refers having been undertaken about 1798. Some years before this, runs the narrative, a ewe belonging to a farmer at Mendon, about fourteen miles from Worcester, Massachusetts, gave birth to twin

[1] *Journ. Royal Agricultural Society*, vol. xx. pt. 2.

lambs remarkable for the shortness of their fore-legs, which were bent in, so as distantly to resemble what are called club-feet, while their bodies were thicker and more clumsy than those of ordinary sheep. They were of opposite sexes, and as they grew up they were observed to be gentler and less active than their parents, so that they were unable to surmount the stone walls of the country. When mated together their progeny showed precisely the same characteristics, and even when crossed with other sheep the lambs were reported to be of the same type. They received the name of otter-sheep from their remarkable shape, and produced both good mutton and good wool, but their peculiar value in a country like New England consisted in their inability to break pasture. Here the account, of which the above is a paraphrase, ends. It differs from the one quoted by Darwin in stating that two lambs of the abnormal type were produced, instead of only a single ram. This, of course, makes all the difference, as it has always seemed remarkable that a single male should have been so prepotent as to give rise to a distinct breed. It is true, indeed, that we are told cross-bred lambs likewise conformed to the original type, at all events in most cases; but this was probably after the breed had become thoroughly established.

"A more interesting case," wrote Darwin,[1]

[1] *Op. cit.*, p. 104.

"has been recorded in the Report of the Juries for the Great Exhibition (1851), namely the production of a merino ram-lamb on the Mauchamp farm, in 1828, which was remarkable for its long, smooth, straight, and silky wool. By the year 1833 M. Graux had raised lambs enough to serve his whole flock, and after a few more years he was able to sell stock of his new breed. So peculiar and valuable is the wool that it sells 25 per cent. above the best merino-wool; even the fleeces of half-bred animals are valuable, and are known in France as the Mauchamp merino. It is interesting, as showing how generally any marked deviation of structure is accompanied by other deviations, that the first ram and his immediate offspring were of small size, with large heads, long necks, narrow chests, and long flanks; but these blemishes were removed by judicious crosses and selection. The long smooth wool was also correlated with smooth horns; and as horns and hair are homologous structures, we can understand the meaning of this correlation."

So far as I can ascertain, all the domesticated breeds of sheep will cross freely with one another and produce fertile progeny; and it is probable that the same holds good with most, if not all, of the wild species.

The period of gestation in European domesticated breeds varies from 144 days in Southdowns

to 150 days in merinos;[1] hybrids between the two being intermediate in this respect. In some of the Tibetan and Himalayan breeds the period is extended, according to Mr. Brian Hodgson,[2] to no less than 160 days.

In this connection it may be noted that whereas the Tibetan breeds, and in a somewhat less degree the merino, are but little modified, or, in other words, generalised types of sheep, the Southdown is a highly modified or specialised breed, which comes to maturity at a very early age. This being so, it would be quite natural to expect that the fœtal life of that breed should be shortened.

Analogous variations occur in the relative degree of fertility of the various breeds, some usually producing only a single lamb at a birth, while others commonly produce twins or even triplets. Among British breeds the Shropshire is noted for its fecundity, sometimes producing four or even five lambs at a birth, but the most fruitful of all appears to be the earless Shanghai breed, of which a small flock was exhibited in the London Zoological Gardens in the year 1857. These, according to Mr. A. D. Bartlett,[3] bred twice in a year and produced four or even five lambs at a time; three ewes having given birth to no less than thirteen lambs

[1] Darwin, *op. cit.*, p. 101.
[2] *Journ. Asiat. Soc. Bengal*, vol. xvi. p. 1010.
[3] *Proc. Zool. Soc. London*, 1857, p. 105.

between them in the spring of 1857. A description of this breed will be found in a later chapter.

Great diversity of view has prevailed among naturalists with regard to the ancestry of the domesticated breeds of sheep. As a summary of these views is given by Darwin,[1] who refrained from committing himself to any definite opinion on the subject, it will suffice to mention that whereas Dr. L. J. Fitzinger, to whose writings frequent reference is made in the sequel, believed tame sheep to be derived from no less than ten distinct wild species, other writers have considered that the number of parent forms was not more than two or three. Of late years the trend of opinion has been in the latter direction, and it seems most probable that the existing mouflon or European wild sheep and one of the races of the Asiatic urial have formed the chief, if not indeed the sole, parent stocks. If this be so, it would seem that, as in the case of the ox, there were two centres of domestication, one in Europe and the other in Asia; the Asiatic product being first introduced into Europe with the arrival from the East of the ancestors of the prehistoric Swiss lake-dwellers. It is, however, quite likely that certain extinct species more or less closely related to the mouflon may have participated in the production of the European domesticated breeds.

[1] *Ob. cit.*, p. 97.

As to the origin of sheep as a whole we are still very much in the dark, practically all that is known being that the group is a comparatively modern one, which does not apparently date further back in time than the early part of the Pleistocene or the later part of the Pliocene division of the Tertiary, or latest, geological epoch.

Certain remarkable ruminants, with curiously twisted horns, occurring in the Pliocene formation of the Isle of Samos and known as *Criotherium*, have been regarded as closely allied to sheep, but it seems doubtful if the relationship is as close as has been supposed, and it certainly does not indicate direct ancestry. In an earlier part of the present chapter[1] mention has been made of certain extinct antelopes from the Lower Pliocene strata of Greece, characterised by the spiral of the horns running in the same direction as in those of sheep, and hence called *Oïoceros*. Mr. Gaillard, who proposed this designation, has suggested that these extinct antelopes represent the ancestral stock from which sheep were developed; but further evidence is required before this view can be definitely accepted.

It will be unnecessary on this occasion to refer to what is known with regard to the ancestry of the family *Bovidæ* in general, especially since I have given a summary of this in another work.[2]

[1] *Supra*, p. 14.
[2] *The Ox and Its Kindred*, p. 34.

Mention has been already made of the fact that sheep in the wild state are essentially mountain animals whose headquarters are in Central Asia. It has to be added that they shun forest, and feed entirely by grazing, or by nibbling the shoots of herbaceous plants, such as wormwood and heather. This, of course, involves a life in the open, where, in bright weather, they are exposed to the full sunlight; and to such an existence their type of colouring is specially adapted. With the exception of the all-white Alaskan bighorn, whose home is amid snow and glaciers, all wild sheep have the upper surface of the body much darker than the belly, which is, in fact, white; this arrangement of colouring being designed to render the animals in which it occurs as inconspicuous as possible when standing in the open in full sunlight, owing to the fact that the light belly neutralises the effect of the dark shadow cast by the body. When the colour of the upper-parts is fawn or rufous there is not infrequently a black flank-band dividing the fawn of the back from the white of the under surface, and it is not unlikely that this may aid in breaking up the outline of the animal when seen at a distance.

It is noteworthy that this protective type of colouring disappears more or less completely in the domesticated breeds, to which it would, of course, be utterly useless. In a few instances, indeed, as

the pigmy Cameruns representative of the maned breeds, the arrangement of the colouring is absolutely reversed, the back being rufous and the belly black.

As regards their value and importance to mankind, it is perhaps not too much to say that sheep occupy at least as high a position as any other animal. It is true that the alpaca of the Andes supplies material for food and raiment in much the same manner as sheep, but then, like its relative the camel, it has but a local distribution, whereas sheep are spread over the greater part of the world. Many nationalities make great use of the milk of ewes, either in its natural form or in the shape of curd and cheese, or in both forms; and, except among Buddhists, the use of mutton is universal among all people by whom it is obtainable. The high value and economical importance of wool is too well known to need more than passing mention; in addition to this, the lambs of some of the Asiatic fat-tailed breeds yield the fur known in commerce as Astrakhan, in which, as mentioned in a later chapter, there is an extensive trade. The fat-rumped breeds appear to be the source of a very large proportion of the Russian tallow imported into Western Europe. But this does not exhaust the commercial products of sheep, for the hides, with the wool or hair attached, are used largely for mats and rugs, or as garments; while, when tanned

or otherwise prepared, they yield excellent descriptions of thin leather, and likewise parchment, which is made solely from the skins of sheep and goats. The horns and hoofs are valuable as sources of glue. In Tibet sheep are employed to carry salt, borax,[1] and other commodities across the passes.

Although, as noted above, originally natives of Europe and the cooler regions of Asia, domesticated sheep have been introduced into nearly all parts of the world suited to their habits, including the greater portion of Africa, America, Australia, New Zealand, &c.; the introduction into Africa having taken place in prehistoric times, whereas the importation into the other countries mentioned was, of course, a comparatively modern event. Further information on this subject will be found in a later chapter; but it may be mentioned here that domesticated sheep appear to be more or less comparatively unknown in the Malay countries, the warm humid climate and dense forests of which are obviously unsuited to the constitution and habits of these naturally mountain animals.

[1] The Tibetan trade in borax has been practically killed by the export of that chemical from the United States.

CHAPTER III

THE MOUFLON, OR WILD SHEEP OF EUROPE, AND ITS FORERUNNERS

When the great Swedish naturalist Linnæus wrote his *Systema Naturæ* in the middle of the eighteenth century, he appears to have been ignorant of the existence of a wild sheep in the islands of Sardinia and Corsica; and it was therefore not till some years later that this mouflon, as it is called by the French—the musmon or musimon of the natives of Sardinia and Corsica—received a scientific name; the designation *Ovis musimon* having been given to this species by the German naturalist Schreber in 1795. At a later period it was thought that the mouflon differed in certain important structural features from domesticated sheep—the typical representatives of the genus *Ovis*—and it was accordingly referred to a genus by itself, under the name of *Caprovis*. Subsequent investigations showed, however, that this supposed difference is non-existent; and there are good grounds for regarding the mouflon as the ancestral stock from which some of the European tame breeds have taken origin. If it could be definitely

PLATE II

FIG. 1

FIG. 2

FIG. 1. A Mouflon Ram.
FIG. 2. A Soa Ram.

ascertained which breed — or breeds — originated from the mouflon, it would be obvious that, if such breed could be regarded as the type of the *Ovis aries* of Linnæus, the proper designation of the mouflon would be *O. aries musimon*.

The name mouflon, or muflon, appears to have been invented, like several others in natural history, by the French naturalist Buffon. The animal (pl. ii. fig. 1) is about the size of an average tame sheep, but much more neatly built, so that it has a more antelope-like appearance, the resemblance being enhanced by the replacement of the woolly fleece by a coat of close-lying hair. In common with all the more typical wild sheep, the mouflon has a short, deer-like tail, with twelve vertebræ in the interior. The moderately long head has a nearly flat forehead, but a slight convexity in the region of the muzzle. A small but deep tear-gland is situated near the outer angle of each eye; and the ears, which are about half the length of the head, are relatively short, small, and lancet-shaped, with a slight outward inclination, and very mobile.

In the rams the horns are of the Ammon type, and attain, in proportion to the size of the animal, considerable dimensions. Like those of other sheep, the right horn forms a right spiral; and normally each horn makes a sickle-shaped curve along the side of the face, with the tip directed upwards, forwards, and outwards. Each of the

three surfaces is marked by a number of fine parallel transverse wrinkles, which in old rams are very closely approximated at the bases of the horns.

In horns with this kind of curvature two types may be recognised, in one of which the curve of the spiral is considerably more open than is the case in the other. As the horns of two rams from Sardinia, the one presented by Mr. E. N. Buxton and the other by Mr. Ford Barclay to the British Museum, appear to conform to the close type, there is a presumption that the open type may be characteristic of the Corsican animal; but evidence is required as to whether the two types are really distinctive of the two islands, or whether they both occur together.

This, however, is by no means the only difference in mouflon-horns; the second kind of variation being illustrated by the two heads shown in plate i., which are rams shot by Mr. G. Stallard, of Rugby, in Sardinia in 1902. In the first of these (fig. 1) the horns have the normal curvature, which results in their tips being widely sundered. In the second head (fig. 2), on the other hand, the horns curve backward behind the neck, and their tips are consequently approximated. This is due to a change in the direction of the upper part of the curve, forming what is known as a mathematical perversion, and due to the fact that whereas in the one type the summit of the spiral is directed down-

wards, in the other it is directed upwards. A head from Sardinia in the possession of Mr. H. Brinsley Brooke exhibits a similar perversion in the horn-spiral; and the same feature was displayed by a mouflon living in the London Zoological Gardens in 1911.[1] I have been informed that horns of this type are also occasionally seen in Corsican mouflon.

The interest attaching to this variation is that it represents a condition which is constant in the red sheep (*O. orientalis*) of Cyprus and South-western Asia, as is more fully mentioned in a later chapter. Despite this change in the direction of its summit, the spiral of the right horn still remains right-handed, and *vice versâ*.

Mouflon ewes may be either hornless or furnished with small upright horns. The general statements of sportsmen, so far as they are explicit on the point, indicate that at least some Sardinian ewes are hornless, but it remains to be proved whether all in that island come under the same category. If this should turn out to be the case, the next point to ascertain would be whether all the ewes in the other island are horned, or whether only a percentage are thus furnished. If horned ewes occur only in one of the two islands, whether merely sporadically or generally, we should have evidence of a racial distinction between the Sardinian and the Corsican mouflon—a distinction which

[1] R. I. Pocock, *The Field*, 1911.

would be accentuated if it were found to be accompanied by a difference in the curvature of the horns of the rams. Were such a racial distinction established, the next thing would be to ascertain whether the Sardinian or the Corsican mouflon is the typical *Ovis musimon*, a point which seems at present uncertain.

As regards the presence or absence of horns in the ewes of Sardinian mouflon, Mr. Brooke states that he never encountered horned females, and similar testimony has been communicated to me by Captain Bowring, R.N.[1] On the other hand, a horned ewe mouflon head, now in the Norwich Castle Museum, shot in Corsica by Captain J. Marriott about 1899, indicates that some at least of the females in that island bear horns.

Standing about 27 inches at the withers and slightly more at the croup, the male mouflon has limbs of medium length and strong and powerful make, which terminate in short and sharp-edged hoofs. The short and smooth-lying hairy coat, which is underlain by a fine under-fur, is extraordinary thick and close in winter, but becomes somewhat thinner in summer. In colour it varies considerably, according to age and the season of the year. In the summer dress of adult rams the neck, shoulders, back, flanks, and the outer surface

[1] See a letter from Mr. E. P. Barnard in *The Field* of June 20, 1907.

of the upper part of the fore-legs and thighs, are reddish fawn, with an admixture of black hairs, or reddish brown with a tinge of ashy grey. On the sides of the back is a quadrangular area, or saddle-patch, of a yellowish white or whitish colour; and from the base of the neck to the tip of the tail runs a dark brown or blackish spinal stripe. The lower sides of the neck and breast are blackish, and on the front border of the upper part of the fore-leg is a blackish streak, a similar band running along each flank to divide the dark of the upper-parts from the white of the belly. The crown of the head and the sides of the face are blackish ash-grey; and a blackish line extends backwards from each angle of the mouth, and unites with its fellow on the throat. The muzzle, a ring round each eye, the inner surface of the ears, the lower parts of the legs, from the knees and hocks downwards, the buttocks, the borders of the tail, and the whole of the under-parts are white; while the inner sides of the limbs are dirty grey.

In the winter coat the whole animal becomes darker, the general colour tending to chestnut-brown, with a larger admixture of black. The spinal stripe, for instance, is almost completely black, especially on the withers. Younger rams are brighter in colour than the adults, with the hind part of the back light yellowish, and the upper surface of the tail fawn-brown. Ewes, although

inferior in size, do not differ noticeably in colour from the rams.

Dr. J. U. Duerst[1] believes that there is a second species of mouflon, common to Sardinia and Corsica, for which he has proposed the name *Ovis matschiei.* Compared with what its describer regards as typical mouflon, it is stated to be more brownish grey, tending to ashy grey, in colour, sometimes with a white-spotted face; the dark-brown horns forming curves of which the tips are directed strongly outwards. The claim of this so-called species to distinction is, however, extremely doubtful; and it certainly does not constitute more than a local race of *O. musimon.*

Half a century ago the mouflon was abundant in the eastern districts of Sicily, more especially on Monte Lerrone, in Patada, and, in a somewhat less degree, in the neighbourhood of Budoso and Nuoro. There was an isolated colony on the mountains of Argentiera, in Nurra, and a second in the neighbourhood of Iglesias and Teulada. It is still to be found in more or less abundance in several parts of the island, as it is also in the mountains of the interior of Corsica.

When Dr. Fitzinger wrote the first part of his review of the breeds of tame sheep,[2] he stated that

[1] In M. Wilckens' *Grundzuge der Naturgeschichte der Haustiere*, 2nd ed., pp. 177 and 180, Leipsic, 1905.

[2] *Sitzber. Ak. Wiss. Wien*, vol. xxxviii. p. 150, 1859.

the mouflon still survived in the mountains of Murcia, in Spain; but this is very doubtful, although the species occurred in Spain in the time of Pliny. It is also believed to have inhabited at one time the mainland of Greece and the Balearic Islands; but from considerations advanced in the seventh chapter it is possible that the Grecian mouflon may have been the Asiatic *O. orientalis*.

It has been thought that testimony in favour of the wider distribution of the mouflon in former times is afforded by the occurrence of remains of wild sheep in the superficial deposits of various parts of the south of Europe. From Pont-du-Château in the Puy-de-Dôme department of France, for instance, a sheep has been described as *Ovis antiqua*,[1] while *O. mannhardi*,[2] from Eggenburg in Lower Austria, represents a second; but, together with *O. argaloides*,[3] described on the evidence of limb-bones from the Certova Cave, near Stramberg, in Moravia, the first of these sheep, as mentioned in chapter xv., is probably nearer akin to the argali than to the mouflon.

In Sardinia the wild mouflon commonly interbreeds with domesticated sheep; and the hybrids, which appear to be perfectly fertile, have been known from the time of Pliny by the name of

[1] Pommerol, *Comptes Rendus Assoc. France*, 1879, p. 600.
[2] Toula, *Jahrb. k.k. Geol. Reichsanstalt, Wien*, 1903, p. 52.
[3] Nehring, *Neues. Jahrb. für Mineral.*, 1891, vol. ii. p. 107.

umber or umbre. The rams carry massive horns very like those of the mouflon, but the coat is woolly in both sexes.

In the year 1882 Dr. T. Studer, of Bern, discovered in the lake-dwellings, or Pfahlbauten, of Lake Bieler, the frontlet and horn-cores of a sheep which appears to have been closely allied to the umber, and is regarded by Dr. J. U. Duerst,[1] who gave it the name of *Ovis aries studeri*, as representing a domesticated breed derived either directly from tamed mouflon, or from a cross between that species and domesticated sheep. In its massive horns this sheep of the Copper Age, as it is called by its describer, is widely different from the turbary sheep, which, as mentioned in a later chapter, was the ordinary breed of the Pfahlbauten, and had relatively small and frequently upright horns. Remains of sheep of the same general type have also been obtained from North Germany, from Bridlington, Yorkshire, and from the bed of the Thames at London Wall. To one of these sheep from the bed of the Thames, Mr. J. E. Millais[2] has given the name *O. aries corneri*, although there is no proof that it is distinct from *O. a. studeri*, which, as being a tame breed, does not really require a technical name.

[1] "Ueber ein neues, prähistorisches Hausschaf (*Ovis aries studeri*)," *Vierteljahrsschrift natfor. Ges. Zurich*, vol. xlix. p. 17, 1904.

[2] *Mammals of the British Islands*, vol. iii. p. 212, London, 1906.

In the opinion of Dr. Duerst, this so-called Copper sheep affords decisive evidence that the mouflon has had a large share in the production of the tame breeds of Western Europe, although it cannot be determined whether the mouflon itself was actually tamed by the Prehistoric inhabitants of the south-west of Europe, or whether it was merely crossed with an already existing breed which must obviously have been derived from the East. My own opinion is in favour of the former view.

As the habits of mouflon are similar to those of wild sheep in general, a very few words will suffice on this subject. They generally associate in flocks numbering from 50 to 100 head, which are led by the oldest and strongest rams; but in the breeding season these split up into smaller parties, each consisting of one adult ram and several ewes. These sheep are largely nocturnal in their mode of life, and at all times are remarkably shy and difficult of approach. They are fond of taking advantage of the protection afforded by the bruyere bushes which grow abundantly in many of their haunts, and when lying down under such shelter are almost impossible to detect. The breeding-season takes place in December and January, when the rams engage in fierce combats previous to the division of the flocks into small parties. The period of gestation is stated to be just short of twenty-one weeks, or say 145 days,

which is intermediate between that of Southdowns and merinos. The young, generally two in number, are born, in a highly developed condition, in April or May. The cry of the adults is a bleat very similar to that of the domesticated breeds, and thus confirmatory of the intimate relationship between the two.

PLATE III

FIG. 1

FIG. 2

FIG. 1. Head of Hebridean Four-horned Ram in the Collection of Sir Basil Brooke.

CHAPTER IV

THE SHORT-TAILED EUROPEAN BREEDS

As mentioned in the preceding chapter, with the exception of the arui, or udad, of Northern Africa, which, as explained later, represents an altogether distinct type, all the species of wild sheep are characterised by their short and deer-like tails. It is, therefore, manifest that the breeds of domesticated sheep which have the shortest tails are those which come nearest to their wild progenitors; and it is very noteworthy that such short-tailed breeds, alike in Europe and Asia, are to be found either in mountain ranges, or on rocky islands with a cold climate, or, in other words, in situations more or less closely resembling the haunts of the various wild species. The medium and long-tailed breeds, which, as we have seen, have acquired an abnormal development of their caudal appendages, are, on the other hand, to be found for the most part on rich lowland pastures.

The very general practice of docking the tails of the longer-tailed European breeds has tended to a great extent to obscure the fact that a number of breeds, both in Europe and Asia, are naturally

short-tailed; and in many works on natural history domesticated sheep are referred to as if all, or nearly all, were furnished with long tails. The fact that many breeds are short-tailed was, however, fully recognised more than half a century ago by Dr. L. J. Fitzinger in the first instalment of his synopsis of the breeds of domesticated sheep.[1]

Dr. Fitzinger even went so far as to regard the short-tailed breeds as specifically distinct from the ordinary longer-tailed sheep of the lowlands, proposing for this supposed species the name of *Ovis brachyura*. There is, however, undoubtedly a more or less complete gradation from the short-tailed to the longer-tailed breeds; and even if this were not the case, there would be no justification for bestowing a separate scientific name on the former, as most, if not all of the older breeds of Swedish sheep, which must be regarded as the typical representatives of the *Ovis aries* of Linnæus, were short-tailed. In addition to the shortness of the tail, these sheep are collectively characterised by their small bodily size, the relatively small, more or less upright, sharply pointed ears, and the coarse, shaggy, and partially hairy fleece, of which the colour is frequently light brown. In most cases the rams carry well-developed horns, more or less closely approximating to those of the wild mouflon.

One of the smallest, and at the same time

[1] *Sitzber. Ak. Wiss. Wien*, vol. xxxviii. p. 192, 1859.

one of the most mouflon-like, of these short-tailed domesticated sheep is a native of the island of Soa, or Soay, in the St. Kilda group of the Outer Hebrides. These small and half-wild Soa sheep belong to a group of breeds, or sub-breeds, which are widely distributed over Northern Europe, and may be collectively designated loaghtan, or lughdoan sheep. Properly speaking this term, which is Manx, and means mouse-coloured, belongs only to the small brown sheep of the Isle of Man ; but it is a convenient one to apply collectively to the whole group. In this wider sense of the term, loaghtan sheep are common to Soa and other islands in the Outer Hebrides, the Isle of Man, Iceland, the Faröes, and the Shetlands, although they are not found pure in the Orkneys. All these sheep display a marked tendency to develop extra horns, the number of these appendages in the rams varying from two, three, or four, to as many as five or six. Although loaghtan sheep are typically cigar-brown in colour, the fleece may be white, grey, dark-brown, black, or piebald. The ewes may either carry small horns or be polled. As a rule, the tail includes twelve or thirteen vertebræ.

In the Soa breed, which appears to be a pure type, the rams (pl. ii. fig. 2) stand only about 24 inches at the shoulder ; and are so small that a quarter of mutton weighs only from 5 to 6 lbs. The under-parts are lighter than the back,

and there are also some light areas on the limbs. The throat of the rams carries a tuft of long hair similar to one frequently developed in the mouflon. In summer the fleece is comparatively short and curly; but when it has undergone the winter's bleaching the tips of the individual hairs become whitish. The wool itself, as in Shetland loaghtans, is of fine and soft quality (unlike that of many short-tailed sheep), and makes beautiful cloth. If not shorn in the spring, the fleece is gradually shed during the summer in large blanket-like masses; and in the Shetlands, Faröes, and Iceland it is the practice, instead of clipping the sheep, to pluck off the fleece piecemeal as it becomes sufficiently loosened.

Soa sheep are never four-horned, and are stated to be smaller than formerly; Mr. H. J. Elwes[1] observes that the original breed of St. Kilda may or may not have been the same, adding that in former days none of them was four-horned. At the present day half the Soa sheep are stated to be blackish, and others are piebald; about half the ewes are horned.

The small black so-called St. Kilda sheep kept in several English parks appear to be of uncertain and mixed origin in most cases, being more or less crossed with black Welsh or other primitive breeds. The rams have frequently—in some flocks usually

[1] *Scottish Naturalist*, 1912, p. 27.

—four horns, while the ewes may in some instances likewise be four-horned. The shortness of the tail is an indication of pure blood.[1]

In the form of its brown horns the Soa ram presents a striking likeness to the wild mouflon; and since, as clearly mentioned, the latter appears to have formerly enjoyed a much wider range than it has at the present day, there is a strong probability that it was the ancestor of the loaghtan breeds. That loaghtans are not derived from the red sheep (*Ovis orientalis*) of South-western Asia is, as indicated later, evident from the difference in the direction of the terminal part of the spiral of the horns; and if the mouflon be not the parent type, this has to be sought—among existing forms—in the urial of the Punjab and Himalaya. It is, however, far more probable that some at least of the domesticated sheep of Northern Europe were derived from an indigenous rather than from an Asiatic wild species. In confirmation of this it may be mentioned—for what the fact is worth—that the colour of the fleece of the Soa sheep is nearer to that of the European mouflon than it is to that of the Asiatic urial.

The Manx, or typical, loaghtans run somewhat larger than the Soa breed, and display a marked tendency to the development of extra horns in the rams. During the nineteenth century these sheep

[1] Elwes, *op. cit.*, p. 32.

were suffered to become very scarce, but of late years the breed has been re-established.

The following passage relating to the Manx loaghtan sheep is from a work by Messrs. Baldwin and Cradock, published in 1837 :—

"The sheep are small on the hills, seldom exceeding eight to ten pounds the quarter, and producing fleeces of short or middle wool weighing two and a half pounds. They have much resemblance to the Welsh sheep, and have most of their peculiarities and bad points. They are narrow-chested and narrow-backed, long in the leg, and deficient in shoulder. They are found both horned and polled, mostly of a white colour; but some of them are grey, and others of a peculiar snuff or brown colour, termed in the island 'laughton' colour. This colour, either covering the whole of the sheep or appearing in the form of a patch on the neck, is considered as the peculiar badge of the Isle of Man sheep. In the valleys a larger sheep with longer wool, a proper long-woolled sheep, is found. The flesh of both breeds is said to be good, and the wool of the hill-sheep valued in the manufacture of stockings and some of the worsted goods."

The original Hebridean sheep are generally believed to have been introduced from Norway, although there is no definite information with regard to this point, or with respect to the aboriginal sheep which may still linger on some of the islands in the

south of Norway. The colour of the fleece appears to be variable; and there is a tendency among the rams to develop four horns, and in some cases, it is said, even five or six. According, however, to Mr. Elwes,[1] rams with five and six horns are only met with in parks, and even four-horned rams are rare in the Hebrides. The one shown in plate iii. fig. 2 was living some years ago in South Uist, while the head with enormous horns shown in fig. 1 of the same plate is that of a ram kept by Sir Basil Brooke in Colebrook Park, County Fermanagh, which died in the early part of 1912.

A correspondent quoted by Mr. H. J. Elwes, after stating that there is no pure breed of four-horned sheep at the present day in the Hebrides, proceeds to observe that "no doubt there is a strain of four-horned blood running through great numbers of the sheep in these parts, but I know no one who will assert he has a breed of such animals. My opinion is that all the four-horned ewes that now crop up, or have cropped up in recent years, are simply throwbacks. It is said that at one time, long ago, all the sheep in these parts were four-horned, and that they were replaced by the black-faced from the Borders, but it would require some research to prove this. It is yearly becoming more and more difficult to procure a good specimen of a four-horned ram; but I have proved one thing,

[1] *Op. cit.*, p. 31.

at least to my own satisfaction, that four-horned rams are certain, or at any rate nearly certain, to throw four-horned lambs."

With regard to the sheep of Shetland, two short quotations must suffice. Dr. A. Edmonston[1] observes that "the sheep is small, not often horned, ears pointed and erect, face, back, and tail short, fine-boned, long legs; naturally mild, active, and hardy, and little liable to disease. The colour generally white, sometimes ferruginous, grey, black, or piebald; the wool very soft and fine."

Writing in 1912, Mr. H. J. Elwes[2] observes that "with regard to horns I am not able to say what is the best or the true type of horns in Shetland sheep. Often the rams have none, and these are preferred for their wool by some breeders. Many have short horns; but in a white ram which I bought in Mid Yell the horns formed a complete circle. Some ewes have short curved horns, but the majority have none, and I never saw any with straight or goat-like horns. A cross with the black-face produces strong horns, and in some cases four are found in rams of this cross."

In the Orkneys the only islands which appear to retain sheep approximating to the original breed are Flotta and Ronaldshay. Mr. Elwes[3] states

[1] *General Observations on Shetland*, Edinburgh, 1840.
[2] *Op. cit.*, p. 5.
[3] *Op. cit.*, p. 7.

that these diminutive sheep "stand about eighteen inches at the shoulder, and are characterised by long, slender limbs, a fine head, and a short tail. The male has a fringe under the throat, as in the Soay breed, and horns which curve backwards between the ears, as in the Bündnerschaf of Switzerland. These Ronaldshay sheep may have in fact sprung from *Ovis aries palustris*, the Bronze Age race with goat-like horns.

"The fleece of these sheep is white, brown, or spotted, but the wool, though fine, is very inferior to that of Shetland."

The suggestion that the Ronaldshay breed is sprung from the turbary sheep (*O. a. palustris*) is obviously incorrect, seeing that the latter, as described in a later chapter, has a relatively long tail.

Lastly, it appears that up to the year 1890 there existed in Duncansbay Head, Caithness, several remnants of a small breed of black, short-woolled, and short-tailed sheep which have been called "keeries." The rams were two-horned, with the horns forming rather more than one complete circle. It has been suggested[1] that these sheep were akin to the black-faced Highland, rather than to the Soa type, but the shortness of the tail is against this.

Four-horned sheep, said to have been black in

[1] See Elwes, *op. cit.*, p. 51.

colour, also existed at one time in Ireland,[1] and apparently belonged to the short-tailed loaghtan type, possibly indeed to a breed closely allied to the modern black St. Kilda strain.

In this connection it may be mentioned that Dr. Nelson Annandale, in a work on the Faröes,[2] after stating that most of the early colonists of the Faröes came from Great Britain, and not, as is frequently supposed, direct from Scandinavia, proceeds to observe that "the Suderoe folk often say that they are of Irish, or rather 'Westman,' origin: and the 'men of the West' in old Norse history include both the inhabitants of Ireland and those of the outer Hebrides. They also gave a name to Westmannhavn on the north-west coast of Stromoe . . . a place which their ships are said to have frequently visited. A certain amount of evidence is given for this view by the fact that a breed of sheep appears to have existed in the Faröes, and especially on the little islands near Suderoe, before the Norse settlement, and, indeed, to have given a name to the group (*fær* = sheep; *ey* = island). It is impossible that these sheep could have originated in little islands separated by nearly two hundred miles of sea from any other land; it is unlikely that they are so ancient as any former land-connection

[1] See P. W. Joyce, *Social History of Ancient Ireland*, vol. ii. p. 280, London, 1902.

[2] *The Faröes and Iceland*, Oxford, 1905.

which may have existed with this country, or that they could have been introduced by other than human agency, though they conceivably may have been brought by a drifting wreck."

This passage, it has been observed by Miss A. Gosset in her book on *The Shepherds of Britain*,[1] may serve to explain the fact of four-horned loaghtan sheep having once been common to Ireland and the Faröes. Possibly some of the so-called black Irish four-horned sheep may have been of the true loaghtan colour.

All the aforesaid loaghtan and allied types of island sheep are graceful, active little animals, recalling in their agile movements their wild relatives. Writing of these sheep, Professor David Low[2] states that "at certain seasons they find their way from the mountains to the shores and feed on the fuci [sea-weeds] and other marine plants. It is remarkable to see them, on the receding of the tide, running down from the hills, as if possessing an instinctive knowledge of the time of ebb. They remain feeding while the sea allows; and sometimes they are caught by the surrounding tide and drowned. Sometimes they are unable, from exhaustion, to ascend again to cliffs of the coast, and so perish; sometimes they are driven into coves, where they are imprisoned until the retiring tide permits them

[1] Page 78, London, 1911.
[2] *Domesticated Animals of the British Islands*, 2nd ed., p. 59.

to escape. It is remarkable that these sheep feed readily on animal substances. One of the greatest resources in some of the islands for keeping them, when no other provender exists, is fish, which are dried on the rocky shores for that purpose. These sheep manifest, in their habits, the rudeness of their condition. The rams will often set upon the other sheep of the flock if wounded, and destroy them. They will furiously attack the females and new-born lambs, as if, in the dreary circumscribed islets they inhabit, they had acquired the instinct of endeavouring to prevent the too great multiplication of their numbers. The ewes, conscious of the danger, make their escape at the time of lambing, that they may bring forth their young in secret."

When removed to lowland and richer pasture, these sheep retain their wild habits and impatience of restraint for several generations.

Short-tailed, and frequently many-horned, sheep, more or less nearly related to the loaghtan type, occur, as we have seen, in Iceland, and they were at one time, at any rate, spread over a considerable extent of the northern countries of the European Continent, such as Norway, Sweden, and Denmark. They have, however, been extensively crossed with long-tailed breeds, so that they are now to be found mainly, or exclusively, only in the more remote districts. In reply to inquiries as to the existence

of such primitive breeds in Sweden, Professor Einar Lönnberg, of Stockholm, wrote to me in 1911 as follows:—

"I beg to state that there are hardly anywhere in Sweden, except in the most remote provinces, any sheep which can be regarded as pure descendants of the old native stock. Certainly none such can be found anywhere near Upsala. Our old stock of sheep has been crossed from time to time with imported breeds (mostly from Great Britain); this being evident from the fact that horned sheep are now but seldom to be seen in the country.

"In the interior of Smäland, on the island of Gotland, and in Yamtland, indigenous breeds may possibly survive; but I have no means of knowing whether any of them are identical with those of the old stock in the central provinces. All of them probably differ to a certain extent locally. Those of Yamtland have remarkably coarse wool."

From Scandinavia short-tailed sheep extend through Finland and the whole of northern Russia;[1] by the Russians they were also introduced into Siberia, to which they were originally strangers. Some of these short-tailed Russian sheep are stated to be very like the Icelandic and Faröe breeds; but in the more northern districts, as well as in the cold climate of Siberia, they run smaller than in the south, but whether they are inferior in point of size

[1] *Vide* Fitzinger, *op. cit.*, p. 198.

to the Soa breed, it is difficult to ascertain. Dr. Fitzinger states that in the north of Russia the ewes are almost invariably hornless, while the horns of the rams seldom attain any great size, although four-horned individuals are by no means uncommon.

These northern short-tailed sheep have, however, been crossed, not only with long-tailed breeds of their own species, with which they produce perfectly fertile offspring, but according to Fitzinger,[1] also with fat-tailed and fat-rumped sheep, and even with goats. Cross-breds, of which the sires are of the fat-tailed breed, are distinguished by their superior size and greater fatness, as well as by a short swollen tail, which carries a large deposit of fat at the base, but terminates in a thin tip. These cross-bred sheep are considered very hardy, and in mountainous districts of Russia, where the snow does not lie very deep, may be kept in the open throughout the winter, which cannot be done in the case of pure-bred loaghtans brought from Iceland. The ordinary Russian short-tailed breed thrives better in elevated and mountain districts than in the plains, and more especially so in the Ural, where it is larger and finer than in the north, and grows better wool.

The aforesaid crossing of the short-tailed breed with fat-tailed and fat-rumped sheep in northern Russia may perhaps be the reason why some of the

[1] *Op. cit.*, p. 201.

rams of the two latter breeds are four-horned in that part of the world, since it does not appear that either of these display that abnormality in other countries.

As regards the alleged hybrids between Russian short-tailed sheep and goats, Dr. Fitzinger[1] states that many of these breed freely, although it is not mentioned whether such breeding takes place between themselves or with one or other of the parent stocks. They are stated to be the result of crossing male goats with female sheep; and are also stated to resemble their dams in every respect except the firmer and stiffer character of the wool. Some further observations on sheep and goat hybrids have been given in the second chapter.

In the highlands of Central Asia short-tailed sheep are represented by several distinct breeds, which form the subject of a chapter (viii.) by themselves.

Domesticated sheep with abbreviated tails are, however, by no means restricted to northern Europe and Central Asia, for the so-called heath-breed of Germany represents this type, and, according to Dr. Fitzinger,[2] appears to be only a rather small and slightly built strain of the one found in northern Europe. He describes it as having upright ears, which frequently display a tendency

[1] *Op. cit.*, p. 201. [2] *Op. cit.*, p. 209.

to bend outwards at the tips ; as a rule, horns are present in both sexes, although it is by no means uncommon to find hornless individuals, more especially among the ewes. The shape of the horns is very constant, departures from the normal type being rarely seen. Four horns are, however, not infrequently developed, although apparently less often than in the northern loaghtans. In two-horned rams the horns are relatively large, long, and thick, especially at the base, from which they gradually but slightly diminish in calibre to the blunt tip. They curve in the usual mouflon-like spiral, without rising much above the level of the crown of the head. Although its thick coat of woolly hair makes it appear somewhat larger, the tail is really as short as in the northern loaghtan breeds, and contains only the same number of vertebræ. The coat differs from that of the continental northern breed only in the circumstance that the whole head, as well as the belly, is clothed with short hair, and that the hair on the body is shorter and more aggregated into knotty tufts. There is, however, a layer of long outer hair, which attains a length of 5 or 6 inches, and hangs down the sides of the body in knotty ringlets which communicate to the animal a somewhat goat-like appearance. The fine under-wool is completely concealed by this long outer hairy covering. As a rule, the head, under-parts, and limbs are black, and the

remainder of the body grey; but uniformly reddish brown or black individuals are by no means uncommon, while wholly white ones occasionally occur. The reddish brown and black individuals are somewhat smaller than the ordinary white ones.

Formerly these short-tailed heath-sheep were to be found on all the heathery districts of northern Germany, but even in Fitzinger's time were being rapidly replaced by superior breeds, and had then almost completely disappeared from Mark Brandenburg, in Prussia, where they were previously numerous. Among other districts where the breed was formerly abundant, may be mentioned the low heath-districts of Hanover, between the Ems and the Elbe, more especially the great open tracts of Lüneburg and Bremer; the stretches of heather-dotted sandy soil in the provinces of Osnabrück, Meppen, Lingen, Hoya, and northern Friesland were likewise noted for these sheep.

Unlike the northern short-tailed breed, these sheep are folded at night and during the hottest hours of the day in summer, while in winter they are only let out for a few hours on fine days. They breed at the end of March or beginning of April, and seldom produce more than one lamb at a birth. The wool is of a coarse character, and best suited to the manufacture of blankets and the like; but the so-called summer fleece, which is the product of an autumnal shearing, is finer. Formerly, at any

rate, large quantities of the wool of these sheep were imported into England, under the name of "Estridge wool," and it was likewise exported to France as *laine d'Autruche*.

The old Danish breed of short-tailed sheep is believed by Dr. Fitzinger[1] to have been the result of a cross between the northern short-tailed breed and the German heath-sheep. In size it is intermediate between the two; and while the rams are nearly always horned, the ewes are frequently so, an additional pair of horns being often developed in the former. As in the northern breed, the very short tail is clothed only with short hair. The fleece consists of goat-like long hairs and an undergrowth of fine and short wool. In colour the face and limbs are either uniformly black or yellowish brown flecked with black, while the body is reddish brown, generally with black under-parts. The breed is, or was, spread over the greater part of Denmark, but is specially partial to high sandy plains. Although formerly very abundant, it had more or less completely disappeared as a pure breed, owing to the introduction of foreign sheep, from most of its haunts so long ago as Fitzinger's time; and at the present day is probably still scarcer, even if it still survives.

Near akin is the Holstein heath-sheep, or Geestschaf, as it is locally called, from Geestland, an

[1] *Op. cit.*, p. 213.

elevated sandy tract in Schleswig-Holstein. According to the writer last quoted, it is a cross-breed between the Danish and the German heath-breeds. Both in size and appearance it is intermediate between the two. With the exception of the head, belly, legs, and abbreviated tail, which are short-haired, these sheep are clothed with long, coarse, and shaggy woolly hair, underlain by finer wool. As a rule, the head and legs are black, and the remainder of the animal grey or reddish brown, but individuals may be wholly reddish brown, black, or even white. Fifty years ago the purity of the breed had been greatly interfered with by crossing, and at the present day it has most likely been altogether obliterated.

France was at one time the haunt of a short-tailed breed which appears to have connected in some degree the German with the dun-faced Spanish sheep, to be next mentioned. The colour is, or was, variable, but as a rule the head and legs are yellowish brown, blackish brown, or black, and the body reddish or greyish brown; but the whole animal may be reddish, greyish, or blackish brown, or even black. In Normandy, the Auvergne, and Provence these small, dark sheep were formerly kept in immense flocks, and were out at all seasons and in all weathers. In Normandy they are known as *bisquains*, in the Auvergne as *canini*, and in Provence as *bocagers*. The weight of the fleece is only from one to two pounds.

In the latter part of the eighteenth century George Culley[1] gave the name of the dun-faced breed of Andalucia to a breed of small, short-tailed sheep reared in Andalucia and Castile, particularly in the Sierra de Somo. These sheep, according to Fitzinger,[2] differed from the other European short-tailed breeds by the general absence of horns in both sexes, while they were further distinguished by the finer, shorter, and more woolly character of the fleece. The face and limbs were short-haired, and the body was clothed with moderately long and shaggy wool, but this became much shorter on the lower surface, which is partially bare. On the face and legs the colour varied from dun to blackish brown, whereas on the body it was a mixture of black and yellowish or reddish brown arranged in piebald fashion, although wholly black, or even wholly white, specimens were not uncommon. In Fitzinger's time it is stated that these hardy little sheep were kept in the open throughout the year, even when the pastures were deep in snow. The fine under-wool was of excellent quality, and used for the finer kinds of cloth, while the longer outer wool was employed in the manufacture of coarser materials; the weight of the fleece did not, however, exceed a couple of pounds. The mutton was of good quality, with a peculiarly fine flavour. The native name of the breed was *ovejas marinas*.

[1] *Observations on Live Stock*, Dublin, 1789. [2] *Op. cit.*, p. 216.

Dr. Cabrera, of the Madrid Museum, informs me that he can find no evidence at the present day of the existence of this breed, and since it is not mentioned in an article on Spanish sheep quoted in the next chapter, it would appear to be extinct.

Among short-tailed sheep Dr. Fitzinger[1] included the old Scottish dun-faced breed, which really belongs, however, to the section with tails of medium length, although it apparently presents considerable resemblance to its old Spanish namesake.[2]

[1] *Op. cit.*, p. 218.

[2] See Low, *Domesticated Animals of the British Isles*, 2nd ed., p. 63.

CHAPTER V

THE MEDIUM-TAILED BRITISH BREEDS

THE great majority of the sheep of the British Islands, including all those found on the mainland, are characterised by the medium length of the tail, a feature due, as pointed out in the second chapter, to domestication. In the majority of breeds the tail is, however, cut at an early age, and thus made even shorter than in the breeds in which its length is normally slight; and to this practice may be attributed that general lack of recognition of the important fact that many of the more primitive breeds of domesticated sheep are naturally short-tailed.

By Dr. Fitzinger [1] the various breeds of ordinary medium-tailed sheep were regarded as a species apart from the short-tailed type, but there can be no doubt that there was in former times a complete gradation from the one to the other; and, as stated at the close of the preceding chapter, the dun-faced Spanish breed, which had a short tail, appears to have been closely related to the longer-tailed Scottish breed which bears the same name.

[1] *Op. cit.*, vol. xxxix. p. 354, 1860.

PLATE IV

FIG. 1

FIG. 2

FIG. 1. Black-faced Highland Ram.
FIG. 2. Welsh Mountain Ram.

These breeds are collectively characterised by a moderately long cylindrical tail, which reaches down to the hocks, and is more or less evenly clothed with wool all round, and lacks an accumulation of fat at the root. The ears are generally small, approximated, and sharply pointed, with a tendency to a sidewards and downwards inclination at the tips. Horns may be either present or absent; when retained, those of the rams usually form a laterally directed open spiral of one or two turns. The horns of the Wallachian breed (described in the next chapter) form, however, a corkscrew-like or screw-like spiral, with a more or less upward direction. In nearly all the horned British breeds horns are common to both sexes, although smaller in ewes than in rams, but in many continental breeds they are retained only in the rams. The fleece is always woolly.

The more typical representatives of this group, that is to say, the breeds with horns of the mouflon type and the hornless breeds, are spread over the whole of Southern and Central Europe, inclusive of the British Isles, and they also occur in Hungary in the form of the rasko sheep, which in some degree constitutes a step in the direction of the Wallachian sheep, and represents a subtype by itself. In the lowlands of Asia they are replaced by the fat-tailed and fat-rumped breeds.

Apart from the short-tailed breeds of the Isle of

Man, Ireland, and the Hebrides and Shetlands, to which reference has been made in the preceding chapter, the British Isles have long possessed a greater variety of sheep than any other country of the same extent; and they also lay claim to having produced some of the finest and most profitable breeds in the world, apart from the merino. One reason why the latter has not found favour in Great Britain is that it is practically an exclusively wool-producing type, whereas in the British Islands, the production of mutton is an essential attribute in order to render any particular breed profitable. Accordingly, one of the great objects of breeders has been to produce strains fitted for the butcher at an earlier period, and yielding heavy carcases. Although such sheep are the most profitable to the breeder and the grazier, the early age at which they come into the hands of the butcher renders their mutton far inferior in quality and flavour to that of the small Welsh and other mountain breeds, which are allowed to attain full maturity before passing to the table of the consumer.

Scotland was in former days the home of various breeds of small sheep belonging to what is known as the soft-woolled type; but even half a century ago these had been so altered by crossing with larger and more profitable breeds from the south that only a few pure-bred flocks remained, and these chiefly in the central Highlands and the

Hebrides. Writing of these breeds Low [1] observed that—

"These sheep presented different breeds, according to the nature of the localities in which they were reared; but they may be described, in general, as being of small size, and lank, agile form; as having short, slender horns; and as having a soft wool, fitted for the making of flannels, but not well adapted for felting. They had the tails long, and not short and flat like the sheep of northern Europe; so that they differed entirely in race from those which, at a subsequent period, were introduced into the remoter islands by the Scandinavian pirates. They were of various colours, frequently brown, and often this brown colour remained on the face when the rest of the body had become white; on which account they sometimes received the name of the dun-faced breed. They were exceedingly wild, and hardly to be confined to common enclosures. They were hardy in a remarkable degree, subsisting on scanty fare, and bearing the rudest treatment, and were remarkably exempt from those diseases which frequently produce such ravages in the modern races."

Wales has likewise a soft-woolled breed of sheep, which differs from the dun-faced stock by having the face white, and the muzzle flesh-coloured. So diminutive are these sheep that,

[1] *Domesticated Animals of the British Islands*, 2nd ed., p. 63.

even when fattened, the quarter of mutton weighs only from 5 to 7 lbs. In these sheep the wool of the neck tends to fall off, and in consequence this part is frequently clipped in autumn.

Anglesea produces an allied but rather larger breed, which is reared on lower ground; this perhaps accounting for its superior size.

The old Radnor sheep likewise presented some features in common with the white-faced Welsh breed, but was more nearly related to the mountain breed of the Principality. The wool, although of the soft type, was long. In weight, the quarter of mutton ranged from 7 to 9 lbs. Modern Radnors have been crossed with Shropshires and other lowland breeds.

The Welsh mountain sheep (pl. iv. fig. 2) are a small breed with the horns, which are present in both sexes, slightly curved and directed backwards in a somewhat goat-like manner. The wool of the flanks is of medium fineness, but on the haunches becomes coarse and wiry in character; the colour of the fleece varies from black or brown to grey. A peculiarity of this breed is the development of a crest of long coarse hair extending from the nape of the neck to the root of the tail, and dividing so as to form a collar round the neck. The quarter of mutton will weigh up to a little more than 5 lbs.

These sheep, which are evidently a very ancient

breed, are to be found, with some slight local variations, throughout the Welsh highlands, from Glamorgan to Merioneth and Carnarvon. In their active habits and capacity for thriving on poor pasture, they retain traits of their wild ancestor. They are quite distinct from the soft-woolled breed of the lowlands.

In Ireland the sheep of the Wicklow mountains are considered to be nearly related to the Welsh mountain breed, from which they differ by the absence of horns in both sexes, as well as by their white faces and legs. The latter feature is, however, evidently due to selection, as there is a marked tendency to the development of black lambs, which are always killed; and it is probable that the loss of horns is likewise due to selection. The wool, although always more or less mingled with hair, is soft, fine, and of considerable length. At high elevations, where bogs and heath abound, these sheep run smaller than at lower levels, and likewise develop a spinal crest of long hair like that of the Welsh mountain breed; the object of this crest in both cases being, according to Professor D. Low,[1] to collect the moisture from the air and allow it to run off without wetting the rest of the fleece. Low also observes that "the lambs are born with a provision against the wetness of the boggy soil, there being a large growth of hair upon the parts

[1] *Domesticated Animals of the British Islands*, 2nd ed., p. 73.

which are in contact with the ground when the animals repose, namely, the breast, the limbs, and the belly." In their active habits and impatience of restraint the Wicklow sheep resemble the Welsh mountain breed.

Ireland is also the home of several breeds of sheep which inhabit lower and drier ground than the last, and therefore differ markedly in physical features. Of these breeds the Kerry, as one of the best known, will suffice as an example. "Kerry sheep," according to Low,[1] "exceed in size the breeds of Wales, of the Wicklow Mountains, and of many of the old forests of England. The horns are generally small and crooked, and sometimes wanting in the female, although some of the allied varieties of other parts have the horns large and spiral. The wool is coarse, and hairy on the haunches, and to a certain degree along the ridge on the back, but on the sides it is very long and fine. The white colour of the fleece prevails; but there is a constant tendency to the development of the darker shades; and the whole sheep would become black and brown, were it not for the choice by breeders of those which are white. These sheep are in a remarkable degree wild and restless in their habits. . . . Their mutton is juicy and of good flavour, which causes them to be greatly valued for domestic consumption. This is their really

[1] *Op. cit.*, p. 76.

valuable property, but it is not of itself sufficient to render them deserving of extended cultivation."

The small breeds of sheep which inhabited the great forest-tracts of pre-Elizabethan England have been to a great extent improved out of existence, although some remain in a more or less pure condition on Dartmoor and Exmoor, as well as on elevated districts in Staffordshire, Leicestershire, Cheshire, and Shropshire. All these sheep were sadly deficient in form, according to modern ideas of ovine symmetry; but they had the redeeming quality of producing a short and fine wool well suited for the manufacture of cloth. In colour their faces and legs were generally black, grey, or dun, although white was not unknown; horns were usually developed, but these might be absent in the ewes or in both sexes. Wild and restless in their habits, these sheep, in common with the other primitive breeds, yielded excellent mutton.

In the old breed of Cannock Chase both sexes were polled; and the same condition obtained in that of Delamere Forest, Cheshire, where the sheep had some resemblance to small Southdowns.

The Dartmoor sheep differ from the other forest breeds in bearing long, soft wool like that of Welsh sheep, and have white legs and faces, with horns in the rams alone. They are bred on the upland heather, and fattened in the low country, where they

will remain contentedly enough during winter, but with the return of spring endeavour to break bounds and seek their native upland pastures. Although their mutton is good, their small size, bad make, and wild, restless disposition render the Dartmoor an unprofitable breed.

Much the same may be said of Exmoor sheep, which are still smaller than those of Dartmoor, and even more wild and intractable. They carry horns in both sexes, and apparently have white faces and legs, while the rams are stated to develop a large goat-like beard on the chin. The fleece is long and silky, and the mutton of prime quality. The rams, which, as in all the forest breeds, are much bigger than the ewes, are of a pugnacious disposition, and display no hesitation in attacking sheep much larger than themselves. Even in Low's time (*circa* 1840) both Dartmoor and Exmoor were rapidly disappearing as pure breeds, owing to extensive crossing with Cheviots, by which they have been largely replaced.

Sheep near akin to the Exmoor breed formerly ranged westward along the Bristol Channel to the valley of the Parret; while to the eastward they were represented by a fine-woolled breed on the Mendips.

The comparatively large breed of white-faced and horned sheep which formerly inhabited the Lake District would seem to have belonged to the

FIG. 1

FIG. 2

FIG. 1. Herdwick Ram.
FIG. 2. Dorset Ram.

forest type. These, however, have long since been replaced on the fells by a smaller and hardier breed, to which George Culley in the eighteenth century gave the name of Herdwick (pl. v. fig. 1). They are included by Low among the so-called black-faced heath-breeds. First raised in the neighbourhood of Muncaster, the Herdwicks gradually made their way all over Cumberland, Westmoreland, and Lancashire, being a hardy breed, quick in feeding, and thus admirably adapted to this bleak district. Their activity is unsurpassed, as they leap like bucks, and ascend stone-walls in almost cat-like fashion. So great is their hardihood, that they have been known to survive and recover after a three-weeks burial beneath a snow-drift. The face and legs are dark, and the wool is of short staple and inferior quality. As a rule, the rams carry somewhat slender horns, but the ewes are polled. The quality of Herdwick mutton is unsurpassed.

The following account of Herdwicks is quoted from the *Morning Post* of 1909 in Miss Gosset's *Shepherds of Britain* :—

"If we are asked to name the hardiest race of sheep kept in this country, we should unhesitatingly give preference to the Herdwick. This breed, a small-horned type of long-wool, lives amongst the crags of the beautiful Fell district of Cumberland. It differs from every other type of sheep reared in England, taking many years to mature, and picking

up a living where even the black-faced hill race of Scotland would starve. History credits it with descent from sheep that escaped from a wrecked Spanish galleon when Drake scattered the proud Armada; but doubt may be thrown upon that supposition, which has been conjecturally used by chroniclers whose researches have led to no definite conclusion. The same theory is held with regard to the black-faced sheep of Scotland. . . . Although in its later years the Herdwick is a light-coloured sheep, the lambs are born with black faces and legs, the only bit of white apparent being round the tips of the ears. At three years old the sheep has changed from a dark colour to a steel-grey. . . . The flocks are wintered on the lowlands, but their home is on the bare rock-crowned hills."

It may be added that there formerly existed in the neighbourhood of Seathwaite a strain of Herdwicks with fourteen pairs of ribs, instead of the usual thirteen.

The well-known mountain sheep rendered familiar to all by the paintings of Sir Edwin Landseer were termed by Professor Low[1] the black-faced heath breed, but since they are mainly characteristic of the mountainous districts of Scotland, they are better designated black-faced Highland. Although Low believed that these striking sheep (pl. iv. fig. 1) found their way into Scotland by way of the

[1] *Domesticated Animals of the British Islands*, 2nd ed., p. 84.

Pennine chain of the north of England, in parts of which they are still bred, their real home at the present day is the Highlands of Scotland, especially in the counties of Perth and Dumbarton, where they are known to have been in existence for more than a century and a quarter. They extend, however, all through the Highlands, from the Grampians to the Pentland Firth, and have likewise made their way into the Hebrides, Shetlands, and Orkneys. In England their range includes, or, at all events, formerly included, the higher mountains of Cumberland and Westmoreland and the heathery moors of Yorkshire and Lancashire. As to their origin and relationship nothing definite is known.

The extreme hardihood of the black-faced Highland, and its capacity for enduring the inclement winter climate of the mountain districts of North Britain even better than the Cheviot, gave it, when once introduced, a foothold which it has ever since maintained. In addition to their capacity for withstanding exposure to biting blasts and severe cold and for thriving on a scant supply of poor food, these sheep are valued for the excellence of their mutton, which is of fine quality and unsurpassed flavour. The wool, on the other hand, is not of a high grade, either in quality or quantity; the fleece of the ewe, when unwashed, averaging only from $3\frac{1}{2}$ to $4\frac{1}{2}$ lbs. in weight.

Although superior in point of size to the Shet-

land, Welsh mountain, and soft-woolled breeds, the black-faced Highland may still be classed as one of the smaller or medium-sized types of sheep.

Both sexes carry horns, which in rams often form two complete turns of an outwardly directed spiral; heads with unusually fine horns being often mounted as snuff-boxes, with a cairngorm set in the tip of each horn. In ewes, the horns are small and thin, forming only about one-half of a circle. The face is clothed with hair, which may be either wholly black or mingled black and white; and the legs are likewise dark, while there is also a tendency to blackness in the fleece, which may be entirely black. The chaffron is strong and prominent, with unusually wide nostrils, and the ears are relatively small and short. The coarse fleece is of the long-woolled type, and hangs loosely on the body; the wool being best suited for making carpets and other coarse descriptions of woollen goods.

When bred at lower levels than ordinary, and more especially in the case of the damp Yorkshire moors, these sheep tend to deteriorate in size, and likewise to lose their horns—particularly in the ewes—and black faces.

Unlike the heavier breeds of the low country, these sheep are wild and impatient of restraint, although not to the same degree as the Welsh mountain breed. Subsisting largely on heather, these sheep feed up to the level where the latter

gives place to mosses and lichens, but do not show that preference for mountain summits displayed by the Welsh breed. Even when exposed to severe privations, the ewes contrive to rear their lambs successfully.

The old name of the breed was "colly," a designation subsequently transferred, with a slight modification in spelling, to the dogs by which the flocks are guarded.

In the summer of 1861 a Highland ram and a couple of ewes were introduced into New York, and a small flock of the same breed was imported into Illinois six years later; the descendants of these forming the main part of the small number of these sheep at present maintained in the United States.[1] The higher zones of the lower Alleghenies would, it is stated by the author just quoted, form the best ground in the United States for these sheep, which are, however, considered less suitable for the American market than the almost equally hardy Cheviots.

Very different in every respect to the Highland black-faced is the Cheviot breed, of the Cheviot range of the south of Scotland, but also extending into the northern districts of Northumberland. Although this rugged district, which includes the greater part of the county of Roxburgh, adjoins

[1] See C. S. Plumb, *Types and Breeds of Farm Animals*, Boston and New York, 1906, p. 453.

the home of the black-faced breed, it is of a very different physical character, consisting of trappean, in place of Palæozoic sedimentary, rocks, which carry, instead of heather, a crop of nutritious short grass and thyme. In the Cheviots the highest peak is 2658 feet above sea-level, so that much of the ground frequented by these hardy sheep is covered with snow long after it has disappeared from the adjoining lowlands. The climate is moist, and in winter inclement.

So far as can be ascertained, this breed has inhabited the Cheviot district from time immemorial, so that nothing is known with regard to its origin and descent. Improvements in the breed date from the year 1777 onwards, but although these have considerably modified its character, they have interfered but little, if at all, with its purity; the crosses which have from time to time been made with the black-faced, Leicester, and merino breeds having been more or less completely eliminated. Nowadays Cheviots are by no means restricted to their original home, as they have been introduced into many other parts of Scotland, including the Grampians and Caithness, where they have displaced the black-faced breed; and they have also been tried on the higher grounds of the west of England, North Wales, and Ireland. Nor does this limit the expansion of the breed, which was first introduced into the United States in 1838, and

somewhat earlier into Canada. Professor Plumb[1] states that in Canada flocks of these sheep "exist in Quebec and several other provinces, while in the United States the breed has been pretty well distributed from Tennessee north, from the Atlantic to the Far West. There are many flocks in eastern New York and northern Indiana, and excellent flocks in Ohio, Illinois, Vermont, Tennessee, Wisconsin, and many other States." Cheviots have also been introduced to a small extent into New Zealand.

Cheviots are white-faced and white-legged sheep of medium size, usually devoid of horns in both sexes. Low states, indeed, that they are always hornless; but, according to Professor Plumb,[2] the rams occasionally carry horns, although more and more rarely. The chaffron is slightly convex, and the head covered with hard, short, white hair to a point behind the ear and round the lower jaw. The nose and lips ought to be black, although they are frequently mixed black and flesh-colour. Shortness of head, with a great width of forehead between the prominent eyes, is a feature of the Cheviot breed, as is also the relatively long and thin ear, which is white and devoid of wool; a third feature being the full pink colour of the skin. Like all mountain breeds, Cheviots are characterised by the lightness of the fore-legs, although this feature has

[1] *Op. cit.*, p. 419. [2] *Ibid.*, p. 416.

in some degree been eliminated by selection. They have also larger bodies than the black-faced Highland, which has given rise to the practice among breeders of distinguishing the two breeds as "long" and "short" sheep. The fleece, which extends forwards on the neck to the ears, forming a kind of frill round the throat, and on the legs reaches to the knees and hocks, consists of wool of a medium type, being neither fine nor coarse, and attaining an average length of about four inches. Long and somewhat hairy wool on the hind surface of the thighs is an objectionable feature. The weight of the quarter of mutton in fat wethers ranges from about 16 to 18 lbs., but in ewes is only from 12 to 14 lbs. Although lacking the flavour of that of the black-faced Highland breed, and less delicate than that of Southdowns and Welsh sheep, the mutton is of good quality. Rams weigh about 200 lbs., and ewes from 150 to 160 lbs.

The fleece formerly weighed only about $3\frac{1}{2}$ lbs., but much heavier weights are now produced. In old days the wool was largely employed in cloth-making, but so early as Low's time it had become to a great extent supplanted by merino-wool; and it is now, after being prepared by combing, instead of carding, used only in the manufacture of the coarser woollens.

Except during heavy falls of snow, when they are supplied with hay or artificial food, Cheviots

generally manage to maintain themselves throughout the year. Occasionally, it is said, these sheep will paw away the snow, in order to reach the grass beneath. They are essentially grazers, refusing to browse on the shoots of heather, after the fashion of the black-faced Highland. They are also quieter in their habits and more amenable to restraint than the latter, although still retaining the independence of character common to all the mountain breeds. In hardiness they have few equals, let alone superiors.

The old Norfolk sheep, which once occupied the higher grounds of Norfolk, Suffolk, and Cambridgeshire, was a long-bodied, long-legged, muscular breed well adapted to subsist on the sparse herbage to be met with in the heather-clad districts of East Anglia. Both sexes carry horns, which are relatively stout in the rams; the face and legs are clothed with short black hair; and the wool is fine and silky. It is by the length of the body and limbs and this silkiness of the wool that the Norfolk is chiefly distinguished from the black-faced Highland breed, in which the wool is harsh, wiry, and unsuited for felting. In modern times the breed has been largely displaced by the Southdown, which may be a derivative from the Norfolk.

These sheep are allied to the black-faced Highland not only in physical characters, but likewise in their fondness for feeding on the shoots

of heather. Although esteemed locally, both for their meat and their fleece, they have been largely displaced, especially in the lowlands, by breeds with more docile dispositions and superior capacity for fattening early.

As being intimately connected with the heath type of sheep, it will be convenient to refer in this place to a breed taking its name from the high-lying district of Penistone, near Huddersfield, in the West Riding of Yorkshire. These sheep are confined to a very limited area, in which the pasture consists of heath mingled with grass; and, in accordance with such rough diet, they themselves are of a coarse and badly made type. Nevertheless, they are well suited to their native district, and it is doubtless for this reason that the breed has been maintained. The Penistone is a white-faced and white-legged breed, specially characterised by the great superiority in size of the rams—which alone carry horns—over the ewes, and the unusual length and muscularity of the tail; the last feature distinguishing these sheep from all other British breeds. Considerable interest attaches to this excessive tail-development, since it serves to confirm the opinion that the length of the caudal appendage in all the long-tailed breeds is due to domestication. The wool of the Penistones is of a silky, and at the same time a harsh and wiry, nature; and their mutton is noted for its juiciness and good flavour.

Wiltshire was formerly the home of a breed of badly made sheep resembling the last in their white faces and legs, but carrying horns in both sexes, and showing no marked superiority in size of the rams over the ewes. The head was coarse, the flanks were flat, and the limbs long and clumsy, while the mutton was of only medium quality. Moreover, from living on poor fodder, these sheep fattened very slowly. On the other hand, their wool was of remarkably fine quality; and it was probably from this character that Dr. Fitzinger, in his articles on the breeds of domesticated sheep,[1] was led to regard the old Wiltshire as a cross between the merino and the old Norfolk breed. There seem, however, to be no valid grounds for such a view. In the form of their horns, which are stated to have turned back behind the ears and about the cheeks, with a marked outward direction at the tips, these sheep differed from all other British breeds, and were in consequence known as "crooks." By about the year 1837 the breed had become more or less completely eliminated, as the result of crossing with the Southdown and other strains, which ultimately led to the development of the modern Hampshire down.

Sheep more or less nearly identical with the old Wiltshire, but having the legs and face in some cases speckled, were once spread over the adjacent

[1] *Sitzber. Ak. Wiss. Wien*, vol. xxxix. p. 784, 1869.

county of Hampshire. Berkshire, too, had a couple of coarse, long-legged breeds of sheep, with convex chaffrons, one of which was horned, while the other was polled.

It is a matter for regret that these interesting old breeds of British sheep were allowed to die out without specimens, or at all events skeletons, being preserved in the national museum; but at the time of their disappearance little or no interest was displayed in the matter of preserving records of such vanishing types. From the point of view of profit, there is of course no doubt that the replacement of these ragged breeds by sheep of the down class was fully justified.

One of the oldest, and at the same time one of the most easily recognised, breeds in the country is the Dorset (pl. v. fig. 2), which is characterised by the presence of horns in both sexes, coupled with white faces and limbs. The horns, which are light brown in colour, attain a considerable development in the rams, but are relatively small in the wethers and ewes. Although the legs are somewhat long, they are free from coarseness; the shoulders are low, and the loins deep. The fleece, which weighs about 4 lbs., is composed of wool of a fine character, although not suited to the manufacture of the better descriptions of cloth. Typically, the lips and nostrils are black, but in a sub-breed inhabiting the adjacent county of Somerset they are pink or

flesh-coloured, as in the merino. This strain, which is a bigger and lankier sheep, producing larger lambs, is accordingly known as the pink-nosed Somerset. There should be a patch of wool on the summit of the forehead ; and the wool of the body grows down nearly to the knees and hocks. In size the Dorset ranges from medium to large among the medium-woolled breeds ; mature rams averaging from 225 lbs., and ewes 167 lbs., although considerably heavier weights are on record.

Dr. Fitzinger,[1] with his fondness for assigning definite origins to the various breeds of sheep on wholly insufficient evidence, if not on no evidence at all, affirmed that the Dorset is the result of a cross between the old Wiltshire breed and the merino. The only marked merino-character seems, however, to be the pink nostrils of the Somersetshire ; and in the large amount of milk yielded by the ewes, and the good nursing qualities displayed by the latter, the Dorset stands miles away from the merino.

The one great characteristic of the Dorset is its early lambing, which is much more pronounced than in any other British breeds ; Dorset lambs being, as a rule, the only ones which can be produced for the Christmas market. As a mutton-sheep, the Dorset can be assigned only a secondary position. Specially characteristic of Dorsetshire

[1] *Op. cit.*, p. 786.

and Somersetshire, the breed is spread to a certain extent over most of the southern counties of England. Professor Plumb[1] writes as follows of the Dorset in other countries :—

"The breed has not been taken up with much avidity abroad. In the United States high-class flocks are found in New York, New Jersey, Pennsylvania, Ohio, and Connecticut, but the breed is found in many other states and also in Canada. Dorsets have been also exported to Australasia and other British colonies. The breed seems well adapted to the level or slightly rolling lands where food is abundant. It has also thriven in the Allegheny mountain region under conditions of good grazing."

A sandy tract lying to the southward of the River Wye, formerly devoted to crops of rye, gave its name to the Ryeland breed of sheep, which, under certain local modifications, at one time extended over the greater portion of the area in the west of England lying between the Severn and the mountains of South Wales. So far as can be ascertained, the Ryeland breed is an indigenous type. Low,[2] for instance, writes that "it may not unreasonably be inferred to be a variety of that widely diffused race of soft-woolled sheep which formerly extended from the mountains and islands

[1] *Types and Breeds of Farm Animals*, p. 414.
[2] *Domesticated Animals of the British Islands*, 2nd ed., p. 156.

of Scotland to the mountains of Wales, and which was probably in possession of the earliest Celtic inhabitants of the British Islands. From its diminutive size, its patience of scanty food, and the lightness of its fleece, we may conclude that it was the native of countries of a low degree of fertility, probably of districts of forests, which, until cleared of their wood, are always unproductive with respect to the nutritious grasses."

The modern Ryeland, as it survived here and there in Low's time, retained the diminutive proportions of the ancestral stock, and was of compact form and gentle disposition, with horns lacking in both sexes. The whole fleece was white, with the wool extending forwards on the head to form a frontal tuft. Ryeland wool was formerly regarded as the finest produced in the British Islands; Leominster being the centre for its distribution, from which it derived the name of Lemster wool or Lemster ore. With the introduction of merino wool it gradually, however, fell into neglect. Attempts were indeed made to increase the stature of the breed and improve the quality of wool; but these, as might have been expected from the wide difference between the two breeds, proved complete failures.

Among the local strains of the Ryeland breed were the old sheep of the Forest of Dean; but these have nowadays become considerably modi-

fied from the original type. The same is the case with regard to the original soft-woolled sheep of the Mendips and several other districts in the west of England.

In fact all the original breeds or sub-breeds of British soft-woolled sheep may be said to be more or less completely extinct; and the use of their wool in the manufacture of the finer descriptions of cloth replaced by that of the merino.

We now pass to the consideration of the so-called down type of sheep, which take their name from the South Downs, where the typical breed was produced. The first for notice is the Suffolk down, which was evolved from the old Norfolk breed, by crossing with South and Hampshire downs, and still retains the black face and legs of the Norfolk, although it has lost the horns. The disappearance of the horns is due to the Southdown cross, while the large size of the breed is attributed to the Hampshire blood. It was not until 1859 that the breed acquired a place even in local shows, and it was soon after recognised by the Royal Agricultural Society. The wool is of the Southdown type, but somewhat deficient in quality.

In 1888 Suffolk downs were introduced into the United States, where, however, they failed to become popular.[1] During the first few years of the present century they have been exported to the

[1] See Plumb, *op. cit.*, p. 421.

PLATE VI

FIG. 1

FIG. 2

FIG. 1. Southdown Ram.
FIG. 2. Border Leicester Ram.

Continent, the Cape, Australia, New Zealand, and Canada. The special claim of this breed to favour appears to be due to the fecundity of the ewes, which commonly give birth to twins, and not infrequently to triplets.

A much more celebrated breed is the Southdown of which the original home is the chalk hills of Sussex; these sheep, together with the nearly allied but larger Hampshire downs, occupying somewhat the same position among sheep as is held by shorthorns among cattle. The black faces and limbs of the sheep of the down type indicate their descent from the old black-faced heath breeds, which when removed to better pasture probably tended to lose their horns. At any rate, it is certain that the Sussex Downs were originally the home of a breed of small sheep with black faces, light fore-quarters, narrow chests, long necks, elongated, slender limbs, and short, fine, curling wool, which showed a marked tendency towards blackness. Professor Low[1] states that although small horns were probably present in the ancestral stock, they have been absent in the breed from the date of the earliest records; on the other hand, Professor Plumb[2] definitely asserts that small horns were occasionally retained.

From these small and ill-formed native Sussex sheep were developed by careful selection the modern

[1] *Domesticated Animals of the British Islands*, 2nd ed., p. 162.
[2] *Types and Breeds of Farm Animals*, p. 378.

Southdowns, which, for a short-woolled type, are almost exactly what sheep ought to be. The credit for the production of the modern breed is due in the first place mainly to John Ellman of Glynde, near Lewes, who commenced his breeding experiments about 1775, and continued them for half a century; and, secondly, to Jonas Webb of Babraham, Cambridgeshire, who commenced breeding these sheep about the year 1821, and, after buying the best stock obtainable, eventually succeeded in producing a strain somewhat superior in size to that established by Ellman.

The modern Southdown (pl. vi. fig. 1), which is destitute of horns in both sexes, is specially characterised by the dusky grey colour of the face and legs, and the extension of the wool on to the forehead, where it forms a tuft, as well as by the short, curly fleece. Compared with the old Sussex breed, it is not only a bigger sheep, but it has acquired heavier fore-quarters, a wider chest, broader back and loins, greater curvature of the ribs, allowing more space for the respiratory and alimentary organs, shorter neck and legs, and a more compact and symmetrical body. The arched form of the neck distinctive of the original breed has, however, been retained. Although the smallest of what are called the middle-wool type of sheep, the Southdown, in consequence of its compact body and the comparative shortness of its limbs, weighs

remarkably well; the average weight of mature rams being about 175 lbs., and that of ewes 135 lbs. Considerably heavier weights are, however, recorded, 206 lbs., for instance, in the case of rams, and 150 lbs. in ewes. Since Ellman's time the quality of the fleece has undoubtedly been improved. For the purposes of the grazier and the butcher, the Southdown stands unrivalled; it comes to maturity early, the mutton is of fine grain and flavour, without, under ordinary feeding, an excessive amount of fat, the bone is fine, and the quantity of offal comparatively small. The flavour of Southdown mutton, when raised on its native hills, is said to be partly due to the number of small snails consumed by these sheep as they graze on the short and sweet grass of the chalk country.

Another valuable attribute of the Southdown is its docile and tractable disposition, which renders it easy to shepherd, and avoids waste of substance by excessive and unnecessary exertion. It has also a sound and healthy constitution, its close and compact fleece enables it to resist changes of temperature with more or less complete immunity, while it will thrive on comparatively scant pasture. The ewes are also very prolific.

All these favourable factors have combined to render the Southdown, despite the inferior quality of its wool, which is unfitted for the manufacture of the finer kinds of cloth, one of the most favourite

breeds in existence. Southdowns have, in fact, been exported to almost every country in the world where sheep-rearing is carried on to a large extent. Professor Plumb,[1] writing on this subject, observes that "even so late as 1903, exports were made to the United States, France, Russia, Australia, the Argentine Republic, Chile, and Japan. Perhaps no breed of sheep during its career has had an equally wide distribution. In the United States [to which they are believed to have been first introduced in 1803] Southdowns are recorded as bred in nearly fifty states, important flocks being kept in Ohio, New York, Pennsylvania, Illinois, Wisconsin, Vermont, and Kentucky. The breed is also well represented in Canada, notably Ontario."

The breeds respectively known as the Oxford and the Hampshire down must of course find a place near the Southdown, but as they are both of comparatively recent origin, a brief notice must suffice in each case. The formation of the Oxford down was commenced about the year 1833, both in Oxfordshire and Hampshire, and by 1859 the breed had become fairly well established, while by 1862 it had gained a position in the Royal Agricultural Society's Show. The first step was the crossing of Hampshire down ewes with a Cotswold ram, but Southdowns were also used in the early days of cross-breeding. As a consequence of the Cotswold

[1] *Op. cit.*, p. 385.

cross, the Oxford down originally had a mottled face and a fleece approximating to the long-wool type, but these features were subsequently eliminated, and the breed now conforms in general character to the Southdown and the under-mentioned Shropshire, although running larger than either, rams commonly weighing 275 lbs., and occasionally reaching 400 lbs., or even more, while ewes scale about 200 lbs. With a dark brown hairy face, and a tuft of wool on the face, the Oxford down differs from the Shropshire by the lighter tint of the brown area and the much smaller amount of wool on the forehead, where, however, the tuft is of greater length and looseness. The Oxford down is also a bigger and heavier sheep, with a longer and looser fleece. From its large size and the fecundity of the ewes, which is nearly equal to that of the Shropshire, the Oxford down soon came into favour as a "mutton-sheep," and flocks have been established in most of the sheep-breeding countries, exclusive apparently of South Africa.

The Hampshire down, as may be inferred from the preceding paragraph, is a rather older cross-bred type than the Oxford, having gained a recognised position in the Shows of the Royal Agricultural Society so early as 1840, under the title of West Country down, a designation which remained in general use for a considerable period. It owes its origin to crossing the old horned and white-

faced breed of Hampshire and Wiltshire, and likewise the black-faced strain of old Berkshire sheep (all of which, as already mentioned, are now extinct as pure breeds), with Southdowns. Only slightly inferior in size and weight to the Oxford down, a very early breeder, with moderate fecundity, and yielding excellent mutton, the improved modern Hampshire enjoys well-deserved favour, and has been introduced into many countries.

The face and limbs are of so dark a brown as to be practically black, the large and sharply pointed ears are dirty mouse-colour at the back, and should incline a little outwards, while the chaffron displays a tendency towards the Roman-nosed type. The relative fineness of the wool is probably an inheritance from the old Wiltshire stock, as is also the convexity of the nose, while the length of ear is attributed to a Cotswold cross.

The Shropshire sheep may be regarded as the most specialised of the down type; this specialisation showing itself in the development of wool on the greater part of the face in the best representatives of the breed. This woolly mask should extend right down to the nostrils, leaving only the tip of the nose hairy. Shropshires run rather bigger and heavier than Southdowns, and carry a fleece with wool of the medium type. The hornless head is relatively larger than in the Southdown, and should have the ears short, broad, and

well covered with fine wool; the hairy areas, together with the ears and legs, being nowadays dark or blackish brown, although formerly greyish brown. In build the Shropshire is a broad-backed, wide-chested sheep, with a body so deep as to make the legs appear relatively short. For the purposes of the butcher these sheep stand high, their mutton ranking in quality next to that of Southdowns. They are also good wool-producers, although the average weight of the unwashed fleece does not probably exceed 8 lbs.

In disposition and tractability Shropshires occupy a high position; this temperament being accompanied by unusual fertility on the part of the ewes, which frequently produce triplets, and occasionally give birth to four or even five lambs at a time. This fecundity is extremely remarkable in a species with only two teats, and in which the maximum number of offspring at a birth should accordingly be two. It is a striking instance of abnormal redundancy due to domestication.

The modern Shropshire has been evolved from the old black-faced and horned breeds of the Mendips, Cannock Chase, and other parts of Shropshire, which existed in a more or less pure state in the first decade of the nineteenth century, by crossing them with Southdowns, Leicesters, and Cotswolds; the two latter breeds being used to produce bodily size and development of fleece. It was not

till about 1855 that the breed obtained general recognition. In 1860 these sheep were introduced for the first time into the United States, where they have of late years attained a wide distribution, as they likewise have in Canada. They have also been introduced into Scotland, Ireland, many parts of the Continent, South Africa, South America, exclusive of the Falkland Islands, Australia, Tasmania, New Zealand, and Jamaica. Although they have done well in some of the mountainous districts of Scotland, these sheep are best suited to open rolling countries with good pasture.

All the foregoing medium-tailed British breeds are natives of mountainous districts, downs, moorlands, or the less highly cultivated parts of the country. Many of them carry horns, at least in the rams; and their wool is for the most part of short and medium length. They comprise, in fact, the breeds which, after the short-tailed group, depart least widely from the wild ancestral type.

Leaving these we pass to the consideration of a more specialised type, all the members of which are long-woolled sheep, devoid of horns in both sexes. The general characteristics of the sheep of this group have been admirably summarised by Prof. David Low[1] in the following passage:—

"They are of large size, and, until improved by art, of coarse form; and the wool which they yield

[1] *Domesticated Animals of the British Islands*, 2nd ed., p. 169.

is long, thick, and tough in the filaments, of inferior felting properties, but tolerably soft to the touch, and rarely approaching to the harsh and wiry character of hair. This kind of wool, from the strength and toughness of its fibres, is unsuitable for being broken into fragments by the action of the card, and is, accordingly, never prepared except for worsted yarn, and by the assorting of the comb. . . .

"The long-woolled sheep of England are the natives of the richer plains, although they have long been carried to all parts of the country where agriculture has provided the means of supplying artificial food. The first and most extensive locality of this class of sheep is the fine tract of New Red Sandstone [Trias] which, extending southward from the lower valley of the Tees, forms the fertile valley of York and Trent; and which, extending from the Vale of Trent to the mouth of the Severn, and thence northwards, includes the greater part of the counties of Nottingham, Leicester, Warwick, Worcester, and a part of Stafford and Lancaster, comprehending a tract of the highest fertility with respect to the production of the grasses and other herbage plants. But connected with this tract, as a locality of the long-woolled sheep, are districts of the Lias and Oolite formations, comprehending the counties of Rutland, Northampton, Gloucester, part of Oxford, and

others, to which may be added the lower parts of Devonshire, and the valleys of the larger rivers in various parts of the country. The second locality of the long-woolled sheep comprehends the flat alluvial tracts of fens on the eastern coasts and the shores of Kent. Conformably to this division, the long-woolled sheep may be arranged in two general groups; first, those of the inland plains, represented by Teeswater, Leicester, and other varieties; and, secondly, those of the fens and alluvial country, represented by the breeds of Lincolnshire and Romney Marsh."

Following this classification, the first breed for notice will be the Lincoln, which, although now extinct in its original form, survives in the modern improved breed, commonly known as the new Lincoln. The old type was a big, coarse, leggy, white-faced, hornless sheep, which exceeded in stature and bulk all other British breeds, and in Europe was surpassed in these respects only by the largest merinos. The unusually thick skin carried an abundant crop of long, coarse wool, the flesh was likewise coarse-fibred and of inferior quality, and the animals were slow in coming to maturity. From this stock, which much resembled the old Leicester breed, was produced, by crossing with new Leicester blood, the modern Lincoln, which still remains the largest and longest-woolled British breed, and grows the heaviest fleece.

The rather broad face, which usually carries a tuft of wool on the forehead, is slightly Roman-nosed, and frequently exhibits a greyish tinge along the middle line of the chaffron, while the large and broad ears are mottled or speckled with grey. The back is remarkably broad and flat and the body deep, while the legs are of a rather coarse type. A natural parting runs along the middle line of the back, from each side of which the wool falls in curly locks. There should be a medium-sized forelock. Rams, when in good condition, commonly attain a weight of 300 lbs., and may exceptionally reach as much as 400 lbs.; but from 250 to 300 lbs. may be given as the average weight of ewes. The weight of the fleece ranges from 14 to 15 lbs. in ewes, and from 18 to 20 lbs. in rams; in fineness of quality the wool is somewhat superior to that of Leicesters, while in length it probably exceeds that of all other breeds, a length of staple of 21 inches being recorded in one instance. As a mutton-producer the Lincoln does not rank high, and the same is the case with regard to its breeding capabilities.

In Great Britain this breed is mainly restricted to the county from which it takes its name and the adjacent districts of the east of England, but it has been largely exported to Russia, Canada, the United States, Argentina, South Africa, and Australia and New Zealand. It has not, however, attained much favour in the United States, where

the dry climate of the eastern states is ill-suited to such large sheep; but in the Argentine it is highly esteemed, very big prices being paid for pedigree rams.

The low-lying district of Romney Marsh, in Kent, which presents much resemblance in physical conditions and climate to Holland, has given its name to an ancient breed of long-woolled, hornless sheep. Originally these sheep were of a large, coarse, long-legged, and flat-sided type; but the introduction, during the early part of the nineteenth century, of new Leicesters resulted in the production of a breed which could scarcely be recognised as the descendants of the old stock, although it still shows traces of coarseness and lankiness. One effect of the cross was to reduce the bodily size, while a second was to produce greater compactness of form and a better quality of mutton. It is not easy to point out features by which these sheep can be distinguished at a glance from other long-woolled types; but it may be mentioned that the forehead may be almost bare of wool, or may carry a considerable forelock. The great advantage claimed for the Romney Marsh sheep is its alleged immunity from foot-rot when reared on wet ground; and for this reason it has been cultivated to some extent in the low-lying districts of the south-east of England other than its native county. It has not, however, attained much favour abroad, except in Australia

and New Zealand, where large flocks are kept. Writing in 1911, the High Commissioner for New Zealand reported that the Romney breed of sheep were making good headway in that dominion, especially in the North Island. In 1905 there were 78 flocks entered in the Flock Book, and in 1910 the number had increased to 200. There were then 706,743 stud sheep and flock-rams in the country, and of these 237,210 were Romneys.

Omitting mention of certain other strains of long-woolled sheep which were formerly met with locally between Staffordshire and the Solway Firth, and some of which lingered longest in the Lake District, reference may be made to others reared in the Lias and Oolite districts of Devonshire and Somersetshire. One breed of these, the so-called Southam Notts, were found in the southern districts of Devonshire to the westward of the Vale of Honiton, and were characterised by their brown faces and legs, lank sides, and crooked limbs. The second breed, the Bampton Notts, so called from a village of that name on the borders of Devon and Somerset, were white-faced and white-legged sheep of considerably larger size and carrying heavier fleeces. All these sheep were of clumsy make, had thick skins, and showed no disposition to fatten readily; but by crossing with the Leicester these faults have been more or less completely eliminated, and the white-faced modern Devonshire is a

valuable breed, specially characterised by its great bodily size; a ram referred to by Low having attained the enormous weight of 430 lbs.

The big and coarse, leggy, narrow-backed, long-woolled sheep, reared from time immemorial in the county from which they take their name, are the parent stock of the modern Leicester breed (pl. vi. fig. 2), which is one of the finest and most valuable of the long-woolled group, although the smallest in point of size. As represented by the true or Bakewell strain, these sheep are characterised by the great width and flatness of the back, the moderately long and often Roman-nosed face, which, unless artificially trimmed, usually carries a forelock, and has a faint bluish tinge, owing to the colour of the skin showing through the white hairs. There are also often dark spots on the face and ears; the ears themselves being thin, delicate, rather large, and more or less nearly erect. The naked part of the nostrils is black. The long and fine legs frequently carry some short wool on the shanks. The wool, which attains a length of about 6 inches, hangs in fine curly locks. In weight, ordinary rams range from 225 to 250 lbs., and ewes from 175 to 200 lbs. As a mutton-sheep the Leicester does not rank high, being too large when full-grown, and, unless killed early, yielding a superfluity of fat.

The credit of establishing the modern type of true Leicester is due to Robert Bakewell, of Dishley

Hall, Loughborough, who began his breeding experiments shortly before 1760. The improvement appears to have been accomplished solely by selection, no alien blood having been introduced.

The so-called Border Leicester, which appears to have been produced by crossing Teeswater ewes with Bakewell Leicester rams, is a larger, heavier, and longer-legged sheep, with the forehead and shanks entirely free from wool, and the hair of the face pure white unmixed with any tinge of blue.

Although Leicesters have been exported to all the sheep-rearing countries of the world, they are nowadays by no means abundant, even in their native county. In Canada, according to Professor C. S. Plumb, small flocks are kept in all the provinces, but more numerously in Ontario than elsewhere; while in the United States the breed is chiefly represented in Michigan, Pennsylvania, Oregon, Nebraska, Iowa, and Illinois.

The Cotswold Hills of Gloucestershire, which take their name from the Saxon *cote*, a sheepfold, and *would*, a bare hill, and form part of a chain of hills of Oolitic rocks extending from the Yorkshire moors to the English Channel near the Isle of Portland, have long been famous for their sheep. In early days these sheep were probably of the soft-woolled type characteristic of Wiltshire and Berkshire; but at some unknown date these were replaced by a long-woolled breed, which has cul-

minated in the modern Cotswold. Formerly the Cotswolds were of the large, coarse, lanky, slow-maturing type common to the old representatives of the long-woolled group; but the old stock was crossed with Bakewell Leicesters, and thereby modified into an improved type. The improvement was not, however, so great as in the case of some of the other long-woolled breeds; and Cotswold sheep, in common with the Romney Marsh breed, exhibit, according to Professor Low,[1] a marked tendency to accumulate fat on the rump almost to the degree of producing a deformity. This is of particular interest in connection with the fat-rumped breeds of Asia and Africa discussed in a later chapter.

The Cotswold is specially distinguished from other representatives of the long-woolled group by the great development of wool on the forehead, where it forms a large curly patch, descending in some cases as far down as the nostrils. The slightly Roman-nosed face may show a tinge or spots of grey or brown, and is dark at the nostrils and relatively broad between the eyes and the muzzle. The back shows the breadth and flatness of the Leicester, but the body is frequently less deep, thereby communicating a somewhat leggy appearance to the whole animal. The wool, which is of a lustrous, although somewhat coarse char-

[1] *Op. cit.*, p. 189.

acter, may grow to 12 or 14 inches in length, and is therefore considerably longer than that of the Leicester. Cotswold rams generally weigh from 250 to 275 lbs., and ewes from 200 to 225 lbs. As regards the quality of their mutton, Cotswolds are on much the same platform as Leicesters.

Cotswold sheep have been exported to the Continent, Australia, New Zealand, Canada, and the United States, but beyond its native county the breed is nowhere common. For a time, indeed, it attained a considerable development in North America, especially in Ohio, Kentucky, Indiana, and Ontario; but of late years there has arisen a demand for smaller mutton, with less fat, and for a medium and finer class of wool, which has checked the expansion of Cotswold flocks.

The moist climate of Ireland is particularly well suited to large sheep of the long-woolled class, of which a coarse and unthrifty type has existed on most of the low grounds from very early times. This native stock was improved some time previously to the year 1840 by crossing with Leicesters; but when Low wrote the improvement had not been carried far enough to render these sheep equal to the best English long-wools.

"They are yet," he observes,[1] "for the most part too coarse in their general form, narrow in the chest, and flat-sided. The wool is only of medium

[1] *Op. cit.*, p. 185.

quality and weight; and there is a sort of harshness about it, which shows that the long wool of Ireland was never of good quality."

In concluding this chapter it may be mentioned that there appears nothing in their physical characteristics to preclude all the breeds of British long-tailed sheep being descended from the wild mouflon, all the horned breeds having horns of the general type of those of the mouflon. On the other hand, if the views of Dr. Duerst with regard to the origin of the extinct turbary sheep, referred to in the seventh chapter, be founded on fact, there may be a more or less considerable intermixture of the blood of the wild Asiatic urial in the domesticated breeds of British sheep.

PLATE VII

FIG. 1

FIG. 2

FIG. 1. Merino Ram.
FIG. 2. Rasko Ram and Ewe.

CHAPTER VI

MEDIUM-TAILED CONTINENTAL AND MEDITERRANEAN BREEDS

Of all the Continental breeds of medium-tailed—as distinct from fat-tailed and long-tailed—sheep, perhaps the best-known and most important is the merino (pl. vii. fig. 1), which although originally, as indicated by its name, a native of Spain, has been acclimatised and established in nearly all the sheep-breeding countries suited to its existence, and is one of those which supplies the bulk of the wool-produce of the world at the present day, if, indeed, it does not completely surpass all other breeds in this respect.

As regards the spread and dispersal of the merino type, it may be mentioned that in the latter part of the eighteenth century the Spanish flocks produced more wool than the factories of the country could work up, and, for a time at any rate, the surplus stock was sold off and exported. In the year 1783, for instance, King Louis XVI. purchased a large estate at the village of Rambouillet, some forty miles west of Paris, where he established an extensive merino-farm. Other flocks of selected

merinos were subsequently introduced from Spain, with the result that in the course of a century the Rambouillet flock by careful selection was developed into a breed of smooth-bodied sheep remarkable for their large bodily size and the excellence of their wool. The size of the Rambouillet breed is indeed so great that these merinos have been nicknamed "elephant-sheep." They have the advantage of being much hardier than their Spanish ancestors. Merinos, and especially Rambouillets, have been exported to South Africa, the United States, South America, Australia, New Zealand, &c. The Cape breed appears to be directly derived from the original Spanish stock, and is now the source of the great bulk of the enormous wool-product of that colony, The Rambouillet breed, on the other hand, is extensively kept in France, Germany, Russia, and other parts of the Continent; and has been largely exported to Australia, Argentina, and the United States. Rambouillets were, however, not introduced into the latter country till 1840, whereas Spanish merinos were imported so early as 1793, and again in 1802.

Soon after the establishment of the Rambouillet flock an attempt was made by His Majesty King George III. to introduce these sheep into England. At that date the exportation of merinos from Spain was prohibited, except with the sanction of the King, and in 1787 an endeavour was accordingly

made to collect a flock surreptitiously. When collected, this flock was driven through Portugal and shipped at Lisbon, whence it arrived in due course at Portsmouth. When, however, these sheep, which had been collected carelessly and indiscriminately from various owners, were received at the royal farm at Kew, they were found to be much too mixed and not of sufficiently good quality for the purposes of experimental breeding. In 1791 application was therefore made to the King of Spain for permission to obtain a selected flock, which was at once granted; and eventually a small flock of negrette merinos—the finest of all the Spanish breeds—reached Windsor, whence they were transferred to Kew, where experiments were made in naturalising them, and crossing them with British breeds. For a time all seemed to go well, and a sale of these sheep was held in 1810, at which good prices were realised. Soon afterwards, however, when a Merino Society, with Sir Joseph Banks as president, had been established, these sheep began to decline in favour with English farmers—possibly on account of mismanagement—and merino-rearing was practically abandoned. After the death of George III. the remnant of the royal flock came into the hands of Mr. T. B. Sturgeon, of South Ockenden Hall, Essex, by whose family the breed was maintained at least down to the year 1885.

One at least of the reasons why merinos are unsuited to British farmers is their slowness in reaching maturity and their incapacity for fattening —an incapacity which cannot be remedied by feeding with corn and oil-cake. As a matter of fact, merinos are essentially adapted for producing wool, which grows not only on their bodies, but likewise on their limbs right down to the hoofs as well as on their faces. Moreover, they thrive well on grass of poor quality, and flourish but little better in the richest pastures. Consequently, while admirably adapted for countries like Australia, South Africa, and Argentina, where wool is the main object of production, they are not fitted for the requirements of the English breeder.

From very early days Spanish merinos were divided in their native country into two groups, according as to whether they were kept on the same pastures permanently, when they were known as *estantes* (stationary), or whether they were driven every spring to graze in the mountains during summer, wherein they returned in autumn to their proper homesteads. These travelling flocks, which are known as *transhumantes* (migratory), would appear to be the typical representatives of the breed, as the name merino itself, according to Professor David Low,[1] is derived from an adjective

[1] *Domesticated Animals of the British Islands*, 2nd ed., p. 133, London, 1843.

applied to sheep which are moved from pasture to pasture. Merinos in their native country are denizens of the lowland plains; the sandy downs and uplands of Spain being tenanted by various breeds of short-woolled sheep. That merinos have been inhabitants of Spain from the time when the country was in possession of the Moors is certain, but beyond this nothing definite is known with regard to their history, although it has been suggested[1] that the original stock was imported at an early, although unknown date, from North Africa, where long-woolled sheep with the oily secretion from the skin characteristic of merinos are stated to have formerly existed, even if they are not to be found there at the present day. Indeed, there appears to be historical evidence that long-woolled sheep were imported from Carthage in the days of her splendour to Spain. This, however, is not to be taken as indicative that merinos, or the ancestral stock from which they are derived, are indigenous to Africa. On the contrary, such ancestral stock almost certainly came from Asia, by way of Syria and Egypt, since with the exception of one peculiar species (*Ammotragus lervia*), which is widely different from all the domesticated breeds, Africa has no wild sheep of its own.

Merinos, which are divisible into three main classes and a large number of strains, or sub-breeds,

[1] Low, *op. cit.*, p. 135.

are collectively characterised by the reddish flesh-colour of the unctuous, oily skin, and the long, close wool, which is normally white, although it may be dun or even black on the limbs, face, and ears. The rams have a strongly convex profile, and carry forwardly curving spiral horns of the mouflon type, which often form more than one complete turn; but the ewes are usually hornless. Frequently the loose skin is thrown into transverse folds in the region of the neck, and in some strains these folds are also developed on the body. The legs are long and the sides flat, while the chest is narrow. Very characteristic of these sheep is the presence of coarse wool on the forehead and cheeks, as well as on the lower part of the limbs. The fleece is close, short, and unctuous; from this close character it feels hard when pressed, although it really consists of extremely fine filaments, so that the wool has greater felting properties than that of any other breed: the weight of the fleece is also relatively greater than in any other sheep. Unlike other sheep, merinos do not annually renew their fleeces, which will continue to grow for several successive years. Although Spanish merinos are comparatively small, the Rambouillet strain attains a huge size.

Modern breeders have found it convenient to split merinos into three classes, according to the degree of development of the folds in the skin. In the

first of these the folds extend more or less completely over the whole head and body, and the wool is extremely unctuous, having an unusually large proportion of the oily secretion designated by breeders "yolk." Many of the American and Australian strains belong to this class. In the second class the folds are mainly restricted to the neck and chest, although there may be slight ones at the thighs, and the fleece is less oily. To this class belong some of the Spanish and American types. In the third class, which includes Rambouillets, Cape merinos, and the American Delaine strain, folds are absent, the fleece is lighter and less oily than in either of the other two classes, and the carcase is better adapted to the purposes of the butcher.

Mention having been already made of the Rambouillet strain, it must suffice to refer, among many others, to the Spanish negrette strain, which is the largest and strongest of the *transhumantes* group, with short and rather open wool, much wool on the head and legs, a heavy dewlap, and large horns in the rams.

It is very noteworthy that all the modern improvements in the merino have taken place elsewhere than in Spain. The respective dates of the first importation of these sheep into France, England, and the United States have been already noted; and it may be added that they are believed

to have been first taken to Sweden in 1723, to Saxony in 1765, and to Silesia in 1768. Late in the eighteenth century a few merinos from the flock belonging to King George III. were taken to Cape Colony, and from the product of these others were carried in 1797 to New South Wales, which is now the greatest merino-breeding country in the world, and produces wool of very superior quality. Since, however, it is the object of the present work to direct attention to ancient rather than to modern breeds of sheep, this part of the subject, interesting and important as it undoubtedly is, cannot be pursued further.

A South European breed which approximates to the merino in the large size, spiral twist, and lateral extension of the horns of the rams, is the Macedonian or Parnassian sheep, which appears to have been originally a native of Macedonia and Livadia, whence it has spread to other provinces of Greece, Turkey, and even Smyrna. The horns, as shown in the portrait of a ram formerly living in the London Zoological Gardens, given by Mr. E. T. Bennett,[1] are, however, much longer than in the merino, while the wool, instead of being curled and tufted, is very long and straight, that on the middle of the back falling on each side of the body almost to the ground. According to Dr. L. J. Fitzinger,[2]

[1] *The Gardens and Menagerie of the Zoological Society*, vol. i. p. 259, London, 1835.

[2] "Über die Racen des zahmen Schafes," *Sitzber. Akad. Wiss. Wien*, vol. xxxix. p. 355, 1860.

the ewes are usually hornless, although they may be furnished with horns of the general type of those of the rams, but shorter and thicker. In the rams the horns, which are brown in colour and set far apart on the head, form two complete turns of an open, outwardly directed spiral. The long and narrow ears are directed upwards and outwards, and the moderately long tail is clothed with long and shaggy wool. The wool of the body is dirty yellowish white in colour, but the feet and face are darker, and frequently dark brown. These sheep, which are large, and are found both in the mountains and on the plains, remain out all the year.

In Wallachia and Moldavia are found breeds of sheep which Dr. Fitzinger[1] regards as having been developed by crossing the Macedonian sheep with the corkscrew-horned Wallachian sheep (described later). Both breeds resemble the Macedonian sheep in general character, but have shorter wool. The Wallachian breed is kept in large herds not only in Wallachia, but likewise in Smyrna, Servia, and Bosnia. The Moldavian breed, which is likewise found in Bessarabia, is imported in thousands to Constantinople and other parts of Turkey, their flesh being highly esteemed, and always served at the table of the Sultan.

Of the sheep of Italy, Dr. Fitzinger,[2] after remarking that they once formed in all probability

[1] *Op. cit.*, pp. 357 and 359.

[2] *Op. cit.*, p. 361.

a uniform breed which occurred all over the country, and likewise extended into Sicily, Sardinia, and Corsica, proceeds to observe that during ancient Roman times they were so altered by crossing with imported foreign breeds, that they are preserved in the pure condition only in Sardinia and perhaps Corsica.

The presumably pure Italian breed, as represented in Sardinia, is, he continues, a middle-sized sheep, resembling in this respect the ordinary sheep of Germany, from which it differs little in appearance. The chief difference consists in the longer wool, and a tendency among the rams to develop two or three extra horns. On the mainland the original breed appears to have been somewhat larger, island forms being generally inferior in point of size to their continental representatives. According to a later writer, Dr. Simroth,[1] many of the Sardinian sheep are black, while others are pied. In the southern half of the island white sheep are more prevalent, the black and pied type being abundant only in the northern districts. In some the neck, head, and limbs are alone black. The rams carry stout, brown, mouflon-like horns, with the transverse wrinkles well developed, which form half of one complete turn of a spiral.

In the Natural History branch of the British Museum are preserved two skulls of tame Corsican

[1] *Bemerkungen über die Tierwelt Sardiniens.*

sheep, in which the horns are distinctly mouflon-like. The sheep themselves are stated by the donor of one of these skulls to have long buff wool, with the under surface of the body and the limbs black.

Dr. C. Keller, in a memoir on the domesticated animals of the Mediterranean Islands,[1] states that the Sardinian sheep show signs of affinity with the wild urial of the Kopet-Dagh, on the Persian-Turkestan frontier, and that he could find no evidence of crossing with the wild mouflon. The latter statement, as will be evident from what has been written in chapter iii., is, however, not based on fact.

The sheep of France, apart, of course, from the introduced Rambouillet merinos, according to Dr. Fitzinger,[2] originally conformed more or less closely to one general type, which also extended into Belgium. These sheep are of medium size, and in character to some extent intermediate between merinos and German sheep, although nearer to the latter than to the former, both in respect of size and shape. The head is small and light, with a narrow and bluntly pointed muzzle, a strongly convex profile, and small, pointed, and approximated ears, which incline somewhat sideways. As a rule, only the rams carry horns; but

[1] *Neue Denks. Schweiz. Natfor. Ges.*, vol. xlvi. p. 128, 1911.
[2] *Op. cit.*, p. 382.

when these are present in the ewes, they differ from those of the rams merely by their inferior size. The horns themselves are much shorter and thinner than those of merinos, forming only about one-half of a complete spiral turn, with the tips directed forwards and outwards. The moderately long tail, which is clothed with wool, and contains sixteen vertebræ, reaches to the hocks. The wool, which is curly only on the neck and back, is short and thick, although longer on the under-parts and the sides of the tail. The general colour is dirty or yellowish white, although not infrequently dark or blackish brown, and often pied. The horns are yellowish horn-colour and the hoofs black. In many parts of France sheep are kept not only for their wool and flesh, but likewise for the milk of the ewes.

By crossing with foreign breeds several local strains have been produced from the original French long-tailed sheep. One of the best-known of these is the Berrichonne breed, originally developed on the estates of the Ducs de Berri in north-western France, where the soil is mainly of a sandy nature, but subsequently carried to several other parts of the country. It is one of the oldest breeds, and is stated to be the result of crossing the original French sheep with merinos.[1] From the former it is distinguished by its superior size and stouter build, as well as by the more convex profile; and

[1] *Vide* Fitzinger, *op. cit.*, p. 385.

likewise by the finer quality of the wool, which extends in some degree on to the lower part of the limbs.

The Poitou or Bayonne breed, on the other hand, is characteristic of the mountainous districts of the south-western and south-eastern provinces, more especially in the neighbourhood of Roussillon and Bayonne and in the districts of Poitou and Provence. This breed is likewise regarded as the result of crossing the original French stock with the merino, and is nearly equal in size to the latter, while in form it is to a great extent intermediate between the two parent stocks. The head is larger than in the merino, with the muzzle narrower, the forehead flatter, and the nasal region less convex; while the crinkled wool is not so fine in texture.

The Solognote breed is found on poor heathy and swampy ground only in the neighbourhood of Sologne, between Orleans, Blois, and Bourges, in north-western France, and is believed to have originated by crossing the original native breed with the Berri strain. These sheep are reared both for mutton and for wool: the latter is shorter than that of the Berri breed, but much superior in point of fineness to the product of the pure French breed.

The Ardennes sheep, although typically a native of the province from which it takes its name, reappears in the south-east of the country in Burgundy, and in both districts is kept in large

flocks. That it is a product on the one side of the original French stock appears certain, but there is some doubt as to its parentage on the other, although it is suggested by Fitzinger that this may have been from a half-bred strain of the German sheep. Being of this cross-bred nature, it will be unnecessary to describe its character.

Yet another hybrid stock is the Normandy sheep, which may be the product of a cross between the old French and the Friesian breeds. There is likewise the dwarf Breton breed, of Brittany, which is probably allied, and, with the exception of a West African breed, and another in Socotra, is apparently the smallest of all sheep. Some fifty years ago these tiny Breton sheep were not infrequently imported into England, and exhibited at the Smithfield Club Show. Both sexes, according to an illustration in Wood's *Natural History*,[1] are hornless.

Germany and Eastern Europe are the home of a type of long-tailed sheep characterised, under various local modifications, by the convex profile of the nose, and the rather long, coarse, and wavy or straight wool, which covers the whole animal with the exception of the short-haired head and the lower parts of the feet. Sheep of this type extend over the whole of Germany, the adjacent districts of France and Belgium, southern Holland, Austria, Styria, Carinthia, and the Tyrol as far as northern Italy;

[1] Vol. i. p. 679.

and they are likewise spread over Bohemia, Moravia, Silesia, the greater part of Hungary, as well as Galicia, Poland, and Lithuania (Grodno). As a rule, the rams are horned and the ewes hornless; the horns of the former being of the general mouflon-type. Very frequently the whole colour is dirty white, but the face may be reddish. These sheep are divided by Dr. Fitzinger[1] into a number of strains or breeds, some, such as the typical German and the straight-woolled German sheep, being the result of local conditions and selection, while others are due to the crossing of these two with various breeds. Among the hybrid types are the Hanoverian, Pomeranian, Franconian, and Mecklenburg breeds, as well as some of those of Hungary. To discuss these, especially without the aid of illustrations, would, however, be not only practically useless, but likewise wearisome.

Still more unprofitable would it be to refer in detail to breeds like the Friesian (nearly related to the Durham or the old Leicester), which have been introduced into various continental countries from England, and there modified into strains differing but slightly from the parent stock.

Mention may, however, be conveniently made in this place of certain Spanish breeds, other than the merino and the dun-faced, which have been already described. For a full account of these breeds

[1] *Op. cit.*, p. 397.

the reader may consult a series of articles by Mr. P. Moyano, published in *Actas de la Sociedad Española de Historia Naturale* for the year 1900,[1] from which the following particulars are taken.

Of these breeds the Iberian is a small self-coloured sheep varying from white through grey and fawn or tan to black. The rams carry horns; and both the legs and the wool are relatively short. This breed is found in the mountain districts of both Spain and Portugal.

In the remaining breeds both sexes are hornless. Of these the Manchega (pl. viii. fig. 1) has long limbs, short curly white wool, and a distinctly Roman nose. The face is white, but the legs are frequently mottled with tan. Ciudad Real, Albucete, Toledo, Cuenca, and part of Mercia are the chief districts in which this breed is reared.

The Aragonese breed is also a white-faced and long-legged sheep, in which the legs, like the fleece, are wholly white; the wool being short, moderately fine, and rather curly. This breed is chiefly restricted to the province of Saragossa, but it is also found in Teruel, on the confines of Navarra.

The third and last of these hornless breeds is the churra (pl. viii. fig. 2), which is a long-woolled sheep, for the most part white, but in some instances with black patches, especially round the eyes and in the region of the muzzle. It is now to be found all

[1] Vol. xxix. p. 207.

PLATE VIII

FIG. 1

FIG. 2

FIG. 1. Spanish Manchega Ram.
FIG. 2. Spanish Churra Ram.

over Spain, and may be regarded as the common sheep of the country.

Leaving Spain, we may pass to the consideration of a very remarkable and distinct breed commonly known in England as the Wallachian sheep, but termed in Germany the *Zackelschaf*, that is to say the prong (horned) sheep. So distinct indeed is this breed that it was regarded by Linnæus as representing a species (*Ovis strepsiceros*) apart from the ordinary circular-horned domesticated sheep (*O. aries*); this opinion being subsequently adopted by Dr. Fitzinger.[1] The Hungarian rasko sheep, which is generally regarded as a half-breed, shows, however, the manner in which a gradation may take place in respect to the form of the horns from the typical Wallachian sheep to breeds like the Tibetan hunia,[2] in which the spiral is more corkscrew-like than usual and the direction of the axis of the horns more outwards. This indicates how the horns of the Wallachian sheep may have been developed from the ordinary type; and it therefore seems clear that the Wallachian sheep is not entitled to rank as a separate species. Accordingly, if it is to bear a scientific name at all, it should be known as *Ovis aries strepsiceros;* but the practice of bestowing Latin names on domesticated breeds of animals is not one that is to be commended.

[1] *Op. cit.*, p. 343.

[2] See chapter viii.

The old writers, like Buffon in France, Pallas in Germany, and Thomas Pennant in England, believed that the zackel sheep (to use its German designation, as a convenient one) was a native of Crete (Candia) and some of the other Mediterranean islands, as well as of various parts of the mainland of south-eastern Europe. It consequently became very generally known as the Cretan zackel sheep or Cretan sheep, being referred to under the former name by Fitzinger[1] as one of the local races of the zackel sheep, and figured under the latter title in Wood's *Natural History*.[2]

According, however, to Dr. C. Keller,[3] who quotes an observer who visited Crete in 1817 and stated that zackel sheep were then very rare, these sheep are nowadays quite unknown in the island, to which they never appear to have been indigenous; such individuals as were formerly seen there having probably been imported from the adjacent mainland. The proper range of the breed appears to extend from Greece, through Turkey, Moldavia, Rumania, Wallachia, to Hungary and Siebenbürgen.

The distinctive marks of the zackel sheep are the small, pointed, and outwardly directed ears; the very long horns, spirally twisted on their own axis

[1] *Op. cit.*, p. 344.

[2] Vol. i. p. 681.

[3] "Studien über die Haustiere der Mittelmeer-Inseln," *Neue Denks. Schweiz. Natfor. Ges.*, vol. xlvi. p. 141, 1911.

PLATE IX

FIG. 1

FIG. 2

FIG. 1. Wallachian or Zackel Ram.
FIG. 2. Hungarian Zackel Ram.

in a corkscrew-like or screw-like manner, which are born by both sexes, and recall the general appearance of those of the wild markhor goat of the Himalaya, although they are twisted in the same direction as those of the mouflon, that is to say, the right horn forms a right-handed spiral, and *vice versâ*. The fleece consists of long woolly hair, with an undergrowth of finer wool; and the relatively long tail reaches well below the hocks,

There is considerable variation in the direction and twist of the horns, which, as Fitzinger pointed out, appear distinctive of local sub-breeds. For instance, in the ram from Wallachia represented in pl. ix. fig. 1, the horns diverge at an angle of about 45 degrees, and have a corkscrew-like spiral, recalling those of the more open types of the markhor's horns. On the other hand, in the ram shown in pl. ix. fig. 2, which is from Hungary, the horns form a closer and more screw-like spiral, and are much less divergent, recalling in both these respects the closely twisted horns of the Suleman race of the markhor. Very different are the horns of the ram referred to above as being figured in Wood's *Natural History;* the figure having apparently been drawn from a specimen at one time living in the London Zoological Gardens. In this case the basal twist of the horns takes the downward, backward, and outward direction characteristic of ordinary sheep; and it

is not till this curve is completed that the horn assumes the upward direction distinctive of the breed. The horns of the ewes are much smaller, and frequently take an almost straight outward direction. In Hungary the zackel sheep is known as the spiral-horned rasko sheep ; the word spiral being used as indicative of a corkscrew-like twist. An idea that the zackel sheep has been produced by crossing the markhor goat with ordinary sheep has, of course, not the slightest foundation in fact.

In the large ram with strongly divergent horns, which appears to represent the typical form of the breed, the whole head and neck, as well as the limbs, are black, the fleece being dirty white ; but in the one with less divergent horns the face is clay-red in colour. In other cases only the face and legs are black ; while not infrequently the entire colour is dirty white. The long woolly hair on the sides of the body may attain a length of fully ten inches.

In Wallachia and Hungary zackel sheep are kept in large herds, which during the winter are fed in the plains, whereas in summer they are taken to high mountain-pastures. During winter many of the flocks are driven to the milder districts of Rumelia, and even to the shores of the Black Sea. These sheep stand wet soil and a damp climate much better than most breeds ; when in

the mountains they are sheltered only in cold or bad weather. From the long woolly hair are woven blankets, horse-cloths, &c.; and the tanned skin, with the fleece, forms an important part of the dress of the peasants of Hungary, Moldavia, and Wallachia, especially the shepherds. Although coarse-grained, the mutton is well-flavoured and highly nutritive. Formerly, when these sheep were kept in enormous flocks, their flesh constituted the staple supply of mutton in Vienna and other parts of Austria; but since about the year 1820 zackel-sheep mutton has been largely replaced in the markets of the capital by that of other breeds, and when Fitzinger wrote his account of the breed, in 1860, it was a rare thing to see any of these sheep in the Vienna market. Where big flocks are kept the milk of the ewes is largely used for making cheese, although it does not produce the best quality of sheep-cheeses.

A well-known Hungarian breed, the rasko sheep, is stated by Dr. Fitzinger[1] to be the result of crossing the ordinary German long-tailed sheep with the Wallachian zackel sheep; but no mention is made of the evidence on which this assertion is based, and there seems no good reason why the rasko sheep should not represent the ancestral stock of the zackel sheep.

On the other hand, it should be mentioned

[1] *Op. cit.*, p. 353.

that in the opinion of Mr. C. Gaillard[1] the zackel sheep is descended from certain ancient Egyptian sheep with long, outwardly directed horns. In forming this opinion Mr. Gaillard believed the zackel sheep to be a native of Crete, but if Dr. Keller is correct in regarding this as an error, the foundation of Mr. Gaillard's opinion is to a great extent cut away.

According to Fitzinger, rasko sheep (pl. vii. fig. 2), which are chiefly reared in Hungary, although they also occur in Bohemia, resemble zackel sheep in general appearance, but differ markedly in the shape of their horns. Somewhat smaller and standing lower than zackel sheep, they have very similar heads, but with the profile of the nasal region more swollen, and the ears and eyes larger. Although both sexes generally carry horns, it is not unusual for the females to be devoid of these appendages. In the rams the horns are long, not specially thick, and rapidly narrowing towards the blunt tips. From their bases, where they are somewhat approximated, they incline laterally and outwardly so as to form a relatively long but sharply curved double spiral, twisting at first backwards, and then downwards, forwards, and outwards. Those of the ewes, when present, have much the same form, but are thinner and shorter. Although the limbs are shorter than in the zackel

[1] "Le Bélier de Mendès," *Bull. Soc. Anthrop. Lyon*, 1901, p. 18.

sheep, the tail has the same full development, and the fleece is likewise of the same type, although the coarse, shaggy wool of the body is shorter and thicker. The colour is for the most part uniform dirty white tending to brownish, but the head and legs are not infrequently dark brown or black.

In habits the rasko closely resembles the zackel sheep, and is kept on moist ground of the same nature ; thriving equally well on low, swampy meadows or in the mountains. The wool is suited only for the manufacture of coarse cloth and rugs ; but the mutton is fat and well-flavoured. Up to about the year 1845 these sheep were brought in large flocks to the Vienna market, but some time after this scarcely one was to be seen. Later, however, the rasko again came into favour, and it is now reared in large numbers in its native country.

The remarks at the close of the preceding chapter with regard to the probable descent of the British breeds from the mouflon, with perhaps some admixture of urial blood, are equally applicable to the continental breeds.

CHAPTER VII

THE TURBARY OR BÜNDNER SHEEP

Among the débris of the Prehistoric pile-dwellings of the lakes of Switzerland, Professor L. Rütimeyer,[1] of Basle, discovered and described the remains of a small and slender-horned breed of domesticated sheep to which he gave the name of Torfschaf (*Ovis aries palustris*), equivalent in English to turbary or peat sheep. This sheep, which was subsequently found to survive in certain parts of the Grisons, is of such importance and interest that it may be accorded a short chapter to itself.

The earliest inhabitants of these lake-dwellings, or Pfahlbauten, as they are called in German, were a short-headed, or brachycephalic, race belonging to the Mongoloid stock of Asia, which from the earliest historic times till the Middle Ages periodically invaded Europe. Somewhat later the lake-dwellings, which were from time to time destroyed and rebuilt, were invaded by a long-headed (dolichocephalic) race, which became more or less mingled with the short-headed people.

[1] *Die Fauna der Pfahlbauten der Schweiz*, Basle, 1861.

PLATE X

FIG. 1

FIG. 2

FIG. 1. A Bündner Sheep from Disentis.
FIG. 2. Skull and Horns of Old Bündner Ram.

Both these races came from Asia, apparently by way of Mesopotamia; their original home having probably been in the neighbourhood of the Caspian, more especially the district bordering the mountain range known as the Kopet-Dagh, which forms the boundary between Persia and Turkestan.[1]

These people brought with them the turbary sheep, and apparently also the short-horned ox of the Pfahlbauten.[2]

A few years ago the turbary sheep still survived sparingly in the Bünden Oberland, Canton Grisons, especially in the neighbourhood of Disentis, where it is known as the Bündnerschaf; but as it likewise occurs in the Nalps Alps of the Grisons, it is also termed Nalpserschaf. According to the detailed description given by Dr. Conrad Keller, whose figure is reproduced in pl. x. fig. 1, the turbary sheep is a small, black-faced and black-legged breed, with a moderately long tail, reaching down to the hocks, small, narrow, outwardly directed, and very mobile ears, a concave chaffron, and small, laterally compressed horns, with fore-and-aft edges, which usually ascend nearly in the plane of the

[1] See E. L. Trouessart, "Origine Préhistorique de nos Mammifères Domestiques," *Biologica*, Paris, 1911, p. 296.

[2] Certain difficulties with regard to the origin of the Pfahlbauten shorthorn are discussed on p. 138 of my book on *The Ox and Its Kindred* (London, 1912). If the Pfahlbauten shorthorn be identical with the Prehistoric Celtic shorthorn of England, it would seem to have originated from the Asiatic aurochs, and not, as Dr. Duerst believes, from the zebu. If the two are distinct, the zebu-ancestry may be admitted.

forehead, with a backward curvature. In certain cases the horns are somewhat larger in old rams (pl. x. fig. 2), with their tips directed outwards, although still preserving the compressed, and therefore somewhat goat-like character. In the ewes the horns are very small and goat-like; occasionally they are absent. The fleece, which is thick and short, varies in colour from silvery white through iron-grey and dark brown to black; the dark phases frequently showing a white blaze on the forehead, and white patches on the tail and legs. The skull has a large parietal portion behind the horns; and the horn-cores present an elliptical section, with a convex external and a nearly flat inner surface.

Professor Tarnuzzer, in a German serial to which I have unfortunately mislaid the reference, states that, in addition to the Nalpser sheep, there is an allied breed in the Oberland known as the Valser Schaf, or Wallis sheep. And he further observes that in Vindonissa he has discovered bones indicating the survival of the true turbary sheep to classic Roman times.

Dr. Keller[1] believes the turbary sheep, and consequently the modern Nalpser and Wallis breeds, to be derived from the North African arui or udad (*Ammotragus lervia*); but this opinion has been

[1] C. Keller, "Die Abstammung des Bündnerschafer und Torfschafes," *Act. Soc. Helvet.*, vol. lxxxiii. pp. 86–98, 1907.

shown by Messrs. Duerst and Gaillard,[1] and subsequently by the latter writer alone,[2] to be quite untenable, the African species being altogether unlike any of the breeds of domesticated sheep. Further observations on this point are recorded later on in the present chapter.

On the other hand, Dr. Duerst[3] has adduced evidence to show that the turbary sheep is a domesticated derivative from the wild urial of the Kopet-Dagh (*O. vignei arkal*), described in the thirteenth chapter. Excavations undertaken by Dr. R. Pumpelly on the site of the city of Anau, on the Turkestan side of the foot of the Kopet-Dagh, have yielded in the lower layers remains referred by Dr. Duerst to the wild urial; next come others of a transitional type; while in the higher strata are found skulls with a much lighter type of horn, characterised by the greater development of honeycombed structure in the interior, which are identified with the turbary sheep. As a few feet of the strata represent centuries, there was, in the opinion of Dr. Duerst, abundance of time for the modification of the wild, thick-horned and short-tailed urial of the Kopet-Dagh into the tame, thin-

[1] In Musperv's *Recueil des Travaux relatives à la Philologie et à l'Archéologie Égyptiennes et Assyriennes*, Zurich, 1901.

[2] *Op. cit.*

[3] "Animal Remains from the Excavations of Anau," in Pumpelly's *Explorations in Turkestan*, Carnegie Institution of Washington, vol. ii. p. 373, 1908.

horned, and medium-tailed turbary sheep, which, if these conclusions be well established, is thus proved to have been indigenous to southern Turkestan; this conclusion being in accord with the Asiatic origin of the inhabitants of the Prehistoric Pfahlbauten, by whom we must presume these small goat-horned sheep were carried to Europe. It also accords with the theory, referred to in the next chapter, that the domesticated short-tailed sheep of Tibet and the Eastern Himalaya are sprung from the wild urial of those regions.

There is, however, another interesting point in connection with the turbary sheep. In his paper on the origin of the Bündner and turbary sheep Dr. Keller[1] has given an illustration, reproduced in pl. xi. fig. 1, of a group of sheep engraved on a piece of ivory from a tomb at Menidi, north of Athens, belonging to the Mycenean period. Although the drawing, as Dr. Keller remarks, cannot be regarded as faultless, these sheep are characterised by their relatively long, sharp-edged, and somewhat goat-like horns, which curve backwards behind the neck in a peculiar manner, and likewise by the length of the tail, which reaches approximately to the hocks. In the shape of the horns they present a remarkable resemblance to the skull of the Bündner ram in pl. x. fig. 2; and this formerly led Dr. Keller to regard these

[1] *Op. cit.*, p. 9.

FIG. 1

FIG. 2

FIG. 3

FIG. 1. Ancient Mycenean Rams, from a tomb at Menidi.

ancient and presumably domesticated Mycenean sheep as related to the Bündner and the turbary sheep. In spite of the fact that Dr. Keller[1] subsequently withdrew this theory, it will be evident, if the aforesaid figures are compared with the head of an old ram of the Cyprian red sheep (*Ovis orientalis*) in pl. xi. fig. 2, that there is a striking resemblance between the horns of the old Bündner ram and those of both the ancient Mycenean and the modern Cyprian sheep, all being apparently of the "perverted" type[2] characteristic of *O. orientalis*.

This suggests the possibility that *Ovis orientalis*, which inhabits Asia Minor and Persia as well as Cyprus, may have been domesticated at an early period, and that it gave rise in the Mycenean epoch to a breed related to the Bündner sheep, which may accordingly be distinct from the true turbary sheep, or may have combined the blood of that breed and of the ancient Mycenean sheep.

Whatever may be the truth in these respects, it seems evident—on the assumption that the wild mouflon was the ancestral stock of some of the tame sheep of western Europe—that there has also been an admixture of Asiatic blood, not improbably from two distinct stocks, namely the Kopet-Dagh urial and the red sheep of Cyprus and Asia Minor.

[1] On page 144 of the memoir cited below.

[2] For the explanation of this term see p. 17 and chapter xiii.

Here it should be mentioned that an apparently pure-blooded breed of small sheep inhabiting Crete, where it is the commonest kind, is identified by Dr. Keller[1] with the turbary sheep. He describes it as of small bodily size, with legs of medium length, and stout hoofs. The head is goat-like, without a Roman profile, but elongated, with a narrow muzzle. The horns, which are mostly light-coloured, but dark in black individuals, curve backwards and outwards, and are strongly compressed and sharply two-edged, with both surfaces devoid of transverse wrinklings. The tail is long, reaching nearly to the hocks. The fleece is moderately long, not wavy, but coarse and stiff. Generally the colour is white, but iron-grey and black individuals are by no means uncommon.

These sheep abound on the flanks of the central mountain chain of Crete; they are active in their movements, and get over the most rugged ground without difficulty. Hybrids occur between these turbary sheep and the fat-tailed sheep which are largely imported into western Crete from Tripoli.

Terra-cotta statuettes and other evidence indicate the occurrence of this supposed turbary sheep in the Minos period of Crete; while certain remains discovered by Dr. Keller show that it dates back to the polished stone age. It is added

[1] "Studien über die Haustiere der Mittelmeer-Inseln," *Neue Denks. Schweiz. Natfor. Ges.*, vol. xlvi. p. 143, 1911.

by the same writer that the suborbital pits in the skulls of these Cretan turbary sheep are very shallow, and may be absent; and from this he finds support for his theory that the turbary sheep is derived from the North African arui, in which, as already mentioned, they are absent. The presence of such pits in the skulls of the modern, but now extinct, representatives of the turbary sheep is explained by a supposed crossing with Asiatic breeds.

This theory of an African origin of the turbary sheep is, of course, rendered completely invalid if there is any truth in Dr. Duerst's views, as indeed it also is by the fact that the inhabitants of the Pfahlbauten were an Asiatic people, as well as by the aberrant character of the arui, as pointed out by Messrs. Duerst and Gaillard in the passage already cited.

It may be added that in its long tail and in the frequently small size of its horns the turbary sheep is a much more specialised type than the short-tailed breeds of the Isle of Man and Soa, although it has been regarded as a primitive form.

Another inference is that the mouflon believed to have formerly inhabited Greece may have been *O. orientalis* and not *O. musimon*.[1]

Reverting to the Anau deposits of Turkestan, it may be mentioned that the topmost layers yield

[1] *Vide supra*, p. 53.

remains of a hornless sheep, believed by Dr. Duerst to be derived from the turbary sheep, which, in the opinion of the same writer, may have been the parent of the fat-tailed Asiatic breeds.

This chapter may be closed with the following quotation from Dr. Duerst's article[1] in regard to the probable age of the Anau deposits and of the European Pfahlbauten :—

"According to Professor Pumpelly's stratigraphic chronology, which is without doubt the most exact prehistoric chronological table that we possess, the 20 feet of culture-stratum at the base of the North Kurgan [a district of Anau] dates from the latter half of the ninth millennium (8250) B.C. The turbary sheep (*Ovis aries palustris*) attained its full development 6250 B.C., while we find the large-horned transitional form from *Ovis vignei arkal* about 7000 B.C. Therefore, a migration which, leaving Turkestan between the sixth and seventh millenniums B.C., penetrated western Europe, might have taken with it this sheep as well as the turbary pig (*Sus palustris*) and the long-horned cattle. It follows that the turbary sheep could not have arrived in Europe earlier than in the seventh millennium B.C., and since we find its remains in the oldest lake-dwellings and early Neolithic stations of central Europe, these cannot be of greater age."

The author then proceeds to point out that

[1] *Op. cit.*, p. 439.

these conclusions do not accord with previous estimates of the age of our domesticated animals, which he had formerly considered to date from the Palæolithic epoch. Since, however, they are based on what appear to be accurate data, they must overide the earlier estimates; and there is really no valid objection against regarding the early portion of the Neolithic epoch as including the turbary period, and thus being subsequent to the seventh millennium B.C.

CHAPTER VIII

BREEDS OF THE ASIATIC HIGHLANDS AND CHINA

Wild sheep, as mentioned in an earlier chapter, are essentially mountain animals, and are especially numerous in species in the highlands of Central Asia. It is therefore only natural to expect that on the mountain ranges and plateaus of the heart of the Asiatic continent we should meet with domesticated breeds approaching much nearer to the wild species of the same regions than do the breeds of the plains of India and China. And, as a matter of fact, this is really the case, the domesticated sheep of Tibet, and apparently many other parts of the Asiatic highlands, being short-tailed and furnished with well-developed horns, while those of the plains of India, and most, if not all, of the sheep-breeding countries of the East, are either of the fat-tailed or fat-rumped type, and not infrequently have the horns rudimentary or even absent.

Thanks to observations made and recorded more than sixty years ago by Mr. Brian Hodgson, sometime British Resident at the Court of Nepal,

FIG. 1

FIG. 2

FIG. 3

FIG. 1. Hunia Ewe and Ram.
FIG. 2. Head of Cagi Ram.
FIG. 3. Unicorn Barwal Rams.

the domesticated sheep of Tibet and the adjacent districts of the Himalaya are much better known than are those of any other part of the Asiatic highlands; and it is to these that attention is mainly directed in this volume. Mr. Hodgson's article, which is entitled "The Tame Sheep and Goats of the sub-Himalayas and Tibet," was published at Calcutta in the year 1847 in the *Journal of the Asiatic Society of Bengal*, vol. xvi. pp. 1003–1026, and contains good illustrations of the various breeds.

The breed specially characteristic of the Tibetan plateau, and the one employed in carrying salt and borax over the stupendous passes, some of which can be crossed only by yak, sheep, and goats, is known in the western districts as the Hunia, and in the eastern provinces as the haluk. It is a tall, black-faced, and often black-headed sheep (pl. xii. fig. 1), standing from 30 to 32 inches at the withers, usually with horns in both sexes, although these may be absent in the ewes, and a tail not exceeding from $4\frac{1}{2}$ to $5\frac{1}{2}$ inches in length. Frequently the rams carry two pairs of horns, which are then small. When, however, only a single pair is developed in this sex they are relatively slender, set far apart from one another on the crown of the head, and curve spirally outwards, so as to form, when fully developed, two complete turns. In colour they are black. The skin of a four-horned ram presented

by Hodgson to the British Museum, and still preserved there, has the whole head and neck black, and some black markings on the legs. In these respects it exactly resembles the under-mentioned "unicorn" rams, from which, however, it is distinguished by the larger ears and slighter horns. The ears are well-developed, but differ from those of wild species in showing a tendency to droop; and the nose, or chaffron, is somewhat more convex than in the latter.

Summing up the characteristics of the Hunia, Hodgson remarked that this fine breed is distinguished "by extreme docility, by superior size, gracefulness of form, slender horns, of which there are frequently four, and, rarely, even five, a polycerate [many-horned] tendency displayed by no other tame breed of these regions; and, lastly, by the almost invariable mark of a black face. The general colour is almost as invariably white. I never saw a wholly black sheep of this breed; nor, I think, one with perfectly white face and legs. Both the latter parts are invariably dark, black or brown, and there are patches of the same hue occasionally on the neck or hips.

"This genuinely Tibetan race cannot endure the rank pasture or high temperature, or both, of the sub-Himalayas south of the Cachar. . . . But the Hunia does well in the Cachar, and may with care be bred, or at least fattened, in the central regions

at heights not under 7000 to 8000 feet, where the maximum temperature in the shade is not more than 70°. . . . The wool is of the kind called long staple."

The second Tibetan breed of short-tailed sheep is described by Mr. Hodgson as the peluk, or Silinga sheep; the former term being apparently its native designation, while the latter indicates the country where it is produced, Siling being an old title for the Tangut district, lying to the south of the Nan-Shan. The Silinga is indeed essentially the sheep of eastern Tibet and the highlands of the adjacent provinces of China, being found in the neighbourhood of Lhasa, but unknown on the Nari plateau, where the Hunia abounds. It is also imported into Nepal and Sikhim. In general character the Silinga is a smaller and more slender replica of the Hunia, but the face is generally white, although, like the legs, it may be tinged with fawn. Wholly black individuals appear to be less uncommon than in the case of the Hunia. The Silinga and the Hunia supply the Tibetans, who dress wholly in woollens, with the materials for their garments and blankets.

Of these sheep, on the passes north of Sikhim, Sir J. D. (then Dr.) Hooker[1] wrote as follows :—

"They [the Tibetans] had with them above one hundred sheep, of a tall, long-legged Roman-nosed

[1] *Himalayan Journals*, 2nd ed., vol. i. p. 259, London, 1855.

breed. Each carried upwards of forty pounds of salt, done up in two leather bags, slung on either side, and secured by a band going over the chest, and another round the loins, so that they cannot slip off when going up or down hill. These sheep are very tame, patient creatures, travelling twelve miles a day with great ease, and being indifferent to rocky ground."

Although resembling the preceding breeds in the relative shortness of the tail, which is almost bare beneath, and only a little longer than that of the wild urial and argali, the Barwal sheep of that part of the eastern Himalaya termed by Hodgson the Cachar,[1] that is to say the northern districts of that section of the sub-Himalaya lying between Kumaon and Sikhim (inclusive of both), is a very different type. It is essentially a highland sheep, which will not breed in the hot outer hills, let alone in the plains of India. In point of height it is somewhat inferior to the Hunia, but this is more than counterbalanced by its superior stoutness of build. The adult rams are specially characterised by their large, massive horns (pl. xi. fig. 3), which are almost in contact with one another at their bases, whence they rise without obliquity to curve forwards along the sides of the head, so as to form a single complete turn, although there may

[1] This must not be confused with the province of Cachar, to the east of the Bramaputra valley.

occasionally be a portion of a second. In colour the horns are normally brown; they have the front surface unusually broad, and both this and the inner surface flattened, although the outer one is slightly convex. Very characteristic is the high convexity of the nose, or chaffron, and the very small size of the ears, which have their summits abruptly truncated, and are partially concealed by the big horns. The fleece, which is long and shaggy, is almost invariably white, although tan-coloured or reddish faces and legs are by no means uncommon, while wholly black individuals are occasionally met with. Sometimes the ewes are hornless.

Although somewhat coarse, the long-stapled wool of the Barwal is far superior in quality to that of any of the sheep raised in the plains of India, and supplies most of the Buddhist tribes of the eastern sub-Himalaya with woollen materials. The Barwal, of which some fine skulls and horns, presented by Brian Hodgson, are exhibited in the Natural History branch of the British Museum, is essentially a fighting sheep, rams being exported to the Punjab and other parts of India for the purpose of combat, either with their own fellows or with other animals.

Some of these fighting rams, like one presented to the British Museum by the Gaekwar of Baroda, would appear, however, to be half-breeds between

the Barwal and the under-mentioned cago, since they have fully developed ears, and short, curly wool, which is wholly dead white.

In combat the Barwal is absolutely unrivalled, so that it is, *par excellence*, the fighting ram of India. The shock with which two of these rams, after rushing at one another from a considerable distance, is absolutely astounding, the sound of the impact of their heads being audible at a distance of two or three hundred yards. How their skulls stand the shock is a perfect marvel!

In the central region of the eastern sub-Himalaya the place of the Barwal is taken by a nearly allied breed known as the cago, or cagi (pl. xii. fig. 2), easily distinguished by its full-sized, pointed, and somewhat drooping ears, as well as by its shorter and finer fleece. Although nearly as well armed for fighting as the Barwal, the rams of the cago are much less frequently employed for that purpose on account of their inferior size and courage.

Although no mention is made of them in the article quoted above, Mr. Brian Hodgson was evidently acquainted with a remarkable type of ram bred in the frontier district of Nepal and Tibet to which it is convenient to apply the name "unicorn," for two of its skulls, with the horns, were presented by him to the British Museum in 1845. Living specimens of these rams were brought to England

in 1906 among the collection of Nepalese animals presented to H.M. King George V., when Prince of Wales, and were exhibited for a time in the Zoological Gardens in Regent's Park, where one died; the other two being removed to the Duke of Bedford's park at Woburn. The skin of the one that died in London is mounted in the Natural History branch of the British Museum.

Except for the peculiar conformation of their horns, these unicorn rams (pl. xii. fig. 3) accord in all respects with the Barwal, having the same convex chaffron, small truncated ears, and heavy, shaggy fleece. Most of them have the head, neck, horns, and legs black, as in black-faced examples of the Barwal, but in others these parts are pale-coloured.

The horns are closely applied to one another for the greater part of their length, but they diverge more or less markedly at and near the tips; their general direction is upwards and backwards in a bold arching sweep. So close is the union between the hollow horny sheaths that these are more or less completely fused together for the greater part of their length; the united inner surfaces extending down nearly to the bases of the supporting bony horn-cores, so that the latter remain separate from one another; the separation being completed below the points to which the sheaths extend by a thin vertical plate of bone growing up from the frontal bones of the skull. There is some degree of

individual variation in regard to the curvature of the horns, but when they sweep directly backwards in a bold semi-circular curve the tips have to be sawn off in order to prevent injury to the neck of the animal.

On the face of it, this fact is an indication that the unicorn character of the horns of these rams is not a natural feature; and from this and their general appearance I was led, on the initiation of the Duchess of Bedford, to suggest in *The Field* newspaper of December 30, 1910, that art has played a considerable part in the production of the peculiarity. In this communication it was surmised that these rams represented black-headed and black-legged sheep closely akin to, if not identical with, the Barwal, and that the union of the horns was probably effected by bandaging them together at an early age. After the aforesaid article was published I wrote to Colonel J. Manners Smith, the British Resident in Nepal, asking if he would be good enough to make inquiries into the matter. In due course I received a courteous reply, from which the following extract was published in *The Field* of April 27, 1911:—

"The inquiries which have been kindly made for me by His Excellency the Prime Minister of Nepal, Maharaja Sir Chandra Shrim Shere Jang, have resulted in a clearing up of the mystery attaching to these curiosities.

"There is no special breed of one-horned sheep in Nepal, nor are the specimens which have been brought here for sale natural freaks. By certain maltreatment, which is described below, ordinary two-horned sheep are converted into a one-horned variety. The process adopted is branding with a red-hot iron the male lambs when about two or three months old on their horns when they are beginning to sprout. The wounds are treated with a mixture of oil and soot, and when they heal the horns, instead of growing at their usual places and spreading, come out as one from the middle of the skull. . . .

"The breed which appears to be used for the purpose of manipulating and converting into 'unicorns' seems to be exclusively the Barwal, a Tibetan breed of heavy-horned sheep; the horns being of the same type (in miniature) as those of *Ovis hodgsoni*. I am told that the object of producing these curiosities is to obtain fancy prices for them from wealthy people in Nepal. The two-horned Barwal rams are regularly used in Nepal for fighting purposes."

It may be added that a somewhat similar modification in the horns of cattle is effected by the Kafirs of South Africa, who sear the budding horns of calves with red-hot irons, and then bandage them together.[1]

[1] See J. G. Wood's *Natural History of Man*, vol. ii. p. 67, London, 1868.

In Ladak the Hunia type appears to be represented by a medium-sized, white-fleeced, and white-faced short-tailed sheep, in which the horns are much like those of the Hunia, but yellow instead of black.

There is also a smaller dirty white short-tailed sheep in Ladak, in which the face, horns, limbs, and under-parts are black. The horns approximate to the Hunia type, but form less than one complete turn. Specimens of both these sheep, collected in Leh by Mr. Douglas Carruthers, were presented to the Natural History branch of the British Museum by Mr. H. J. Elwes in 1912.

Sheep apparently more or less allied to the Hunia, if we may judge by their horns alone, occur to the north-west and north of Ladak and Tibet. The British Museum, for instance, possesses the skull and horns of a ram from Yarkand, presented by Mr. A. O. Hume in 1891, in which the horns are essentially of the Hunia type, although larger. And in the same collection is a skull, with the horns, of a very fine ram, collected in Mongolia by Mr. Carruthers and presented by Mr. Elwes. In this specimen the horns, which measure 30½ inches in length and 8½ in girth, with a tip-to-tip interval of 25 inches, are very much of the Hunia type, but larger and lighter coloured. They closely resemble

in miniature those of the wild Kulja argali (described in a later chapter), which may have been the original ancestral type.

A skull and horns from Sze-chuan, western China, presented to the Museum by Mr. J. W. Brooke, apparently indicate a nearly allied breed of sheep.

The complete skin and horns of a ram, collected by Mr. Carruthers at Kulja, in the eastern Tian Shan, and presented by Mr. Elwes to the British Museum, undoubtedly represents another member of the Hunia group, having the characteristically short tail. It is a large brown-fleeced sheep, in which the horns are of a heavier type than in the Hunia, with an elevated band on the inner front angle, and finer transverse wrinkles. Each horn forms only one complete turn of a spiral. In a second skull, belonging to the same breed and collected at the same place, the horns measure 25 inches in length and $8\frac{1}{2}$ in girth, with a tip-to-tip interval of $19\frac{1}{2}$ inches.

In this place may be noticed the so-called earless Shanghai sheep, of which a small flock was exhibited in the gardens of the Zoological Society of London in the year 1857.[1] Both sexes are hornless and practically devoid of external

[1] See A. D. Bartlett, *Proc. Zool. Soc. London*, 1857, p. 104, pl. lii. It is there stated that ears are lacking, but Darwin (*Animals and Plants under Domestication*, 2nd ed., vol. i. p. 101) refers to them as being truncated and rudimentary.

ears, which are represented by small truncated rudiments. The face, especially in the rams, exhibits a markedly convex profile; the tail is short, and the fleece, which, like the face and legs, is wholly white, consists of short, rather curly wool mingled with hair. The legs are relatively short, and the body is long and rounded. A skull of a ram from this flock preserved in the British Museum (Natural History) shows no pits for face-glands, from which it may be inferred that such glands were lacking in these sheep. It is also extraordinarily like the skull of the Theban goat of Upper Egypt, although it also exhibits some resemblance to that of the African lop-eared sheep,[1] which is, however, longer and has pits for face-glands.

In its aborted ears, Roman nose, short tail, and white face and legs, the earless Shanghai breed approximates to the Barwal, near which it is provisionally placed. As noticed in the second chapter, the ewes of the Shanghai breed are remarkable for their fecundity. The parents of the Zoological Society's flock were presented by Sir Rutherford Alcock; no other specimens seem to have been received in England; and, according to a letter received from the British Consul, there appear to be none of these sheep near Shanghai at the present time.

[1] See chapter xi.

Mr. Brian Hodgson was disposed to regard the short-tailed domesticated sheep of the eastern sub-Himalaya and Tibet as derived from the great wild argali sheep (*Ovis ammon*) of Central Asia; but another Indian naturalist, Mr. Edward Blyth, who at one time believed[1] that no living wild species of sheep could be regarded as the ancestor of any of the domesticated breeds, subsequently came to the conclusion that the urial or shapo (*O. vignei*), whose range extends from Turkestan and the Punjab to the heart of Ladak, is probably the progenitor of the Barwal fighting sheep of Tibet.[2] This view seems to possess considerable probability of being true; the Roman nose and the white woolly fleece of the Barwal being, of course, features due to the effects of domestication.

This derivation of the Barwal, and doubtless therefore of the allied Hunia from the wild urial, accords well with Dr. Duerst's view as to the origin of the turbary sheep (chap. vii.) from the western race of the same wild species. If both views be true, it follows that some at least of the domesticated sheep of Europe are more or less closely related to their tame short-tailed Himalayan and Tibetan representatives.

[1] *Ann. Mag. Nat. Hist.*, vol. vii. p. 261, 1841; see also Darwin, *Animals and Plants under Domestication*, 2nd ed., vol. i. p. 97.

[2] See Jerdon, *The Mammals of India*, 2nd ed., p. 300, London, 1874.

CHAPTER IX

FAT-TAILED AND LONG-TAILED SHEEP

At the conclusion of his account of the domesticated sheep of Tibet and the eastern sub-Himalaya, referred to in the preceding chapter, Mr. Brian Hodgson wrote as follows :—

"I might next describe the Terai[1] sheep, which seems to be identical with that found all over the Gangetic provinces, and is characterised by medium size, black colour, and very coarse but true fleece, frequent absence of horns in one or both sexes, a nose Romanised amply, very largely drooping ears, and a long thick tail, frequently passing into the monstrous dumba 'bussel' . . . but I shall merely observe of the long-tailed sheep of the Gangetic provinces, the puchia[2] of the natives, that . . . its deviations . . . from the wild and tame sheep of the mountains distinctly prove the ultimate effects of domestication upon these animals to be (1) to augment exceedingly the size of the tail, in length and thickness, one or both, (2) to increase the size and destroy the mobility of the ear, and (3) to

[1] The low forest-country of Nepal.

[2] From *puech*, a tail, the equivalent of the Hindustani *dumba*.

FIG. 1

FIG. 2

FIG. 1. Indian Dumba Ram.
FIG. 2. Africander Fat-tailed Ram.

diminish the volume of the naturally massive horns, until they gradually disappear in one or both sexes; the Romanising of the nose . . . being a further and hardly less uniform consequence of domestication."

The importance of this passage consists in the recognition of the fact that the increase in the calibre or length of the tail in many breeds of sheep, and, it may be added, the deposition of masses of fat on the bullocks of others, are purely and simply effects of domestication, and that the breeds in which they occur are derivatives from ordinary short-tailed or medium-tailed sheep.

The credit of being the first to recognise that domestication is the cause of these features has been given to Hodgson;[1] but, as a matter of fact, precisely similar views were promulgated twenty years previously by Colonel Hamilton Smith,[2] who wrote as follows:—

"The gradations in the scale of domestication appear to be distinguishable, in the first place, by a decrease of bulk in the horns, retaining the original direction, or passing into more elongated spiral turns; by a partial retention of hair on the body, more or less mixed with wool; by the local accumulation of fat on certain parts; by the

[1] See Darwin, *Animals and Plants under Domestication*, 2nd ed., vol. i. p. 98.

[2] In Griffith's *Animal Kingdom*, *Mammalia*, vol. iv. p. 325, London, 1827.

expansion and drooping of the ears; the lengthening of the tail; by the arching of the nasal bones or chaffron; and, last, by the wool changing from white to dark-brown and black."

Dr. Fitzinger,[1] on the other hand, who appears never to have seen Hodgson's paper (at all events, he does not refer to it), regarded these features as indicative of descent from specifically distinct ancestors. He recognised, for instance, four distinct species of these abnormally tailed sheep, namely the fat-tailed *Ovis platura*, as typified by the fat-tailed breeds of North Africa, the long-tailed *O. dolichura*, as represented by the Circassian sheep, the fat-rumped *O. steatopyga*, of Central Asia, and the peculiar *O. pachycerca*, as represented by the black-headed breeds of Somaliland, Nubia, and Southern Arabia.

Darwin,[2] however, long since observed that all these sheep "bear in their drooping ears the stamp of long domestication." And in confirmation of the view that the accumulation of fat in the caudal region is merely a result of domestication, it may be recalled that two of the ordinary British breeds display a tendency to this feature.[3]

Hodgson, as we have seen, derived fat-tailed, or dumba sheep from the short-tailed Tibetan and

[1] "Über die Racen des zahmen Schafers," *Sitzber. Ak. Wiss. Wien*, vol. xli. p. 151, 1860.

[2] *Animals and Plants under Domestication*, 2nd ed., vol. i. p. 98.

[3] *Supra*, p. 118.

Himalayan breeds, which there is good reason to believe are themselves descended from the wild urial. Whether, as Dr. Duerst suggests,[1] fat-tailed sheep have likewise been developed in Turkestan from the domesticated turbary sheep, may be left an open question; but even if such a dual origin really existed, it makes very little difference, since, as we have seen, there is good reason to regard the turbary sheep as a domesticated form of the western race of the urial.

The Bokharan or Astrakhan dumba may be taken as a good representative of the fat-tailed group—a group specially characterised by the accumulation of fat on the sides of the tail, which is usually of moderate length, and has the under side naked. Bokhara and the Kirghiz steppe are the true home of the breed under consideration, which has, however, been carried to Astrakhan and the Crimea, and also occurs in Persia, Syria, and Palestine, the Afghan dumba being closely allied or identical. Writing of the Turki representative of these sheep, Dr. Duerst[2] observes that "the long, limply hanging tail, reaching to the heel-joint [hock], is surrounded by a mass of fat, which has, however, no great size. The rams of this race are horned, the ewes for the most part hornless. The horns of the rams are not very long nor particularly thick;

[1] *Supra*, p. 152.
[2] *Animal Remains from Anau*, p. 378.

they are three-sided, with rounded edges, of which the inner one is always sharper. They rise slightly above the crown of the head, and wind sideways and backwards from the root, forming then a simple spiral turn downwards, forwards, and upwards, while the points turn somewhat inwards. In the neighbourhood of Anau the Afghan Maimene breed predominates. It is a sheep of excellent flesh and large growth. The wool is long and coarse, and the tail long. These sheep are in part horned and in part hornless."

The tail, as in all the members of this group, is much flattened, and has the under surface, except at and near the tip, bare. A longitudinal line down each side marks the backward limit of the fatty area. The head, with the exception of the forehead, the ears, and the shanks of the legs are clothed with short shining hair, and the remainder with a thick fleece of moderately long and curling wool, mingled in places with short silky hair. In colour the fleece varies from pure white, through yellowish and greyish white, to grey, and so on to black. In old animals the hairy areas are mostly white, while the body is dirty yellowish or greyish white. The newly born lambs are covered with a coat of fine, short, silky, wool-like hairs, arranged in closely pressed curly locks ; the colour of the fleece is dark ashy grey, due to the mixture of black and white hairs. In striking contrast to this are the white face and shanks.

This beautiful coat retains its character only for a very few days, after which the close locks open out and the wool lengthens.

These sheep in most parts of their habitat are kept in the open throughout the year, being taken in summer to the higher grounds, but in winter are brought down to the lower valleys in order to escape the extreme cold. The special interest attaching to these sheep is that they form the chief source of the beautiful fur known as Astrakhan, which is the product of the very young rams. The great bulk of these skins comes from Bokhara and Persia, the Crimea yielding a smaller amount. The most valuable are those of unborn lambs, termed by the natives *bareujen*, as in these the double curls of the fleece lie quite close to the skin, and have a beautiful shining and silky appearance, which recalls watered silk or damask. A story was long current that the Bokharans were in the habit of killing pregnant ewes for the sake of the unborn lambs; but this would be, in the first place, a very unprofitable business, while it would likewise be regarded as a crime by the Mohammedans of Central Asia. Such skins of unborn lambs as come into the market are derived from ewes which have died from disease or accident, as was long ago pointed out by the German traveller Pallas, in his account of the sheep of the Russian empire. Most of the supply is, however, derived from young male lambs, which

are killed soon after birth. Black, grey, and silver-white skins are the most beautiful and the most valuable. Writing in 1892 of the trade in the skins of Astrakhan lambs, which are smaller and therefore more valuable than those from Bokhara, Mr. H. Poland[1] observed that "the annual collection is about 600,000, or rather exceeds that number;

A Syrian Fat-tailed Ram.

these skins are generally sold in the cleaned state at Moscow or Noshai-Novgorod, the price ranging from eightpence to two shillings each, according to demand: they are mostly bought by German firms. The skins are sent to Leipsic, where they are dyed black in the well-known dyeing establishments on the Pleisse."

[1] *Fur-bearing Animals*, p. 336, London, 1892.

According to Dr. Fitzinger, the Syrian fat-tailed sheep is only a local form of the Bokharan breed. Of the former, Canon Tristram[1] wrote as follows :—

"There are two breeds of sheep, so far as I could judge from observation, in Palestine. In the northern hills there is a breed apparently not unlike the merino, with short fine wool, well-shaped, short, and fine legs. The common Syrian sheep is much taller, large-boned, with a broad fat tail, hornless head (excepting in the rams), and long Roman nose, such as we see represented in Italian landscapes. The peculiarity of this breed, which by some has been distinguished from the common sheep (*Ovis aries*) under the name of *Ovis laticaudata*, is the enormous development of fat on the tail. This is the only race we noticed in the southern parts of the country, and it seems to have been the breed of the ancient Israelites, the fat of the tail being spoken of as 'the rump.' . . .

"Both Herodotus and Aristotle especially mention the broad-tailed sheep of Arabia and Syria. The tail is simply a mass of fat, and is used for grease, for lamps, and for cooking. The Arabs fry it in slices and esteem it a delicacy, but it is very like fried tallow. Though the carcase does not weigh more than fifty or sixty pounds, the tail will average ten pounds, and I have known it forty

[1] *Natural History of the Bible*, p. 143, London, 1867.

pounds. The horn of the Syrian ram is very large, not spiral, but recurved under the ears."

The fat "rump" of sheep used in sacrifice by the Hebrews and referred to in the above quotation suggests the idea that in Biblical times fat-rumped sheep (pl. xvii.) may have been kept in Palestine. Both adult sheep and lambs were offered by the Israelites in sacrifice, although lambs of the first year appear to have been the most usual victims. The first mention of sheep in the Bible occurs in the second verse of the fourth chapter of Genesis. Throughout the Bible the sheep is referred to as the emblem of meekness and righteousness, whereas goats represent precisely the opposite. Canon Tristram attributed the selection of the sheep for this position to the fact that its fleece is generally white, whereas dark colours predominate in the coat of goats. While admitting that this may have had a large share in the matter, it may be suggested that the evil odour of goats was likewise an important factor in the selection.

Pallas, it may be added, would not admit that the Bokharan fat-tail was a true breed, regarding it as the product of a cross between the undermentioned long-tailed and fat-rumped breed. There is, however, as Fitzinger remarks, no justification for such a view.

Nearly allied to the Bokharan is the Persian fat-tailed sheep. This breed, in place of being

peculiar to the country from which it takes its name, extends into India, where it is known to the natives as the *dumba* or *dumb-wala*, that is to say, the sheep with the big tail. It is regarded by Fitzinger,[1] who incorrectly believed its range to include Tibet, to be a cross between the Bokharan fat-tailed and the Tatarian fat-rumped sheep. Unlike those of the Bokharan dumba, the ewes of this breed sometimes carry small horns, while, on the other hand, the horns of the rams may be either very minute, as in the one shown in pl. xiii. fig. 1, or completely wanting. The tail, which does not as a rule extend much, if at all, below the hocks, is of enormous width and thickness, measuring ten inches or a foot across, and commonly weighing from 20 to 30 lbs., and occasionally even 40 lbs. Although the colour of the long and shaggy fleece is variable, it is usually uniform white, dark, or rufous brown, or even black, and occasionally silver-grey; but piebald and skewbald individuals are by no means uncommon. In the ram shown in the illustration the whole fleece is pure white, but there are black patches on the otherwise white face.

In Persia the lambs of this breed yield that variety of Astrakhan known in the fur-trade as Persian lamb; the skins being of relatively large size and excellent quality.

From Asia this breed has been carried to Mada-

[1] *Op. cit.*, p. 167.

gascar and Réunion (Bourbon), the Mozambique coast of Africa, Cape Colony, and even Guinea. In the island of Réunion it has been crossed with fat-rumped sheep; the hybrids from this union presenting a marked resemblance to both their parents.

The aforesaid introduction of the Persian or Indian dumba into Cape Colony probably gave rise to the Cape fat-tailed breed, or Africander sheep, since the latter, according to Fitzinger,[1] is the product of a cross between the former and the African fat-rumped breed. Both the parent forms appear to have been in existence in Cape Colony during the early part of the Dutch occupation, but when they were first introduced is unknown. It is a common idea that the fat-tailed breed is indigenous, but this cannot be the case. Africander sheep present, it is said, such a marked resemblance to their reputed parent stocks as to leave no doubt as to their origin.

The Africander is a relatively large sheep, although not specially tall. The head is rather large and long, with a flat forehead, a slightly convex chaffron, and the muzzle narrow and rounded. The eyes are unusually small, the ears long, although shorter than the head, not very broad, and slightly narrowed near the tips, and pendent. As a rule, the ewes are hornless, and

[1] *Op. cit.*, p. 170.

the rams provided with moderate-sized horns, which taper rapidly towards the tips, and form a crescentic curve. Typically the tail reaches to the hocks, where it terminates abruptly,[1] but in some examples its cylindrical tip is so lengthened as to sweep the ground, as in the ram shown in pl. xiii. fig. 2, which was presented to the British Museum (Natural History) by the Minister of Agriculture for Cape Colony. This great elongation of the tail in some individuals of this breed, accompanied apparently by a smaller accumulation of fat at the base, is of importance as indicating a transition from the fat-tailed to the long-tailed type. In the naked under surface of its fat-laden portion, and the separation of the bare from the woolly areas by a pair of longitudinal grooves, the tail of the Africander sheep resembles that of the other fat-tailed breeds. Its weight is commonly from 20 to 30 lbs. The colour of the short, thick, and curling woolly fleece varies from uniform dirty white to rusty or dark brown, black, or silver-grey, but piebald and skewbald specimens are not unknown; in the ram represented in the plate, the greater part of the face is tan-coloured, and the fleece white.

Formerly Africander fat-tailed sheep were kept in enormous flocks in Cape Colony, where they constituted some of the most valuable stock of the

[1] See the figure on page 11 of Conrad Schreiner's *The Angora Goat*, London, 1898.

farmers. They are admirably suited to the African climate; and in summer used to be driven to the high mountain pastures, where they fed largely on the succulent and saline plants which abound in such situations. At the commencement of autumn the flocks returned to the plains, where they remained during the winter and spring. The shepherds were either Hottentots or slaves imported from Madagascar, who were assisted by large and fierce dogs, without the aid of which it would have been impossible to keep off lions, leopards, hyænas, and other marauders. When the voyage to India and China was made by way of the Cape, fat-tailed sheep were much in request by both outward and homeward bound ships as a mutton-supply, while their wool was also in considerable demand.

Writing from Port Elizabeth, Mr. F. W. Fitzsimmons, director of the museum in that town, states that there are few Africander sheep now remaining in that district; these being mainly in the hands of natives and old-fashioned European farmers; the main reason for this diminution in numbers being that their wool is practically valueless in comparison with that of merinos.

These sheep were at one time exported to New Zealand and Tahiti, but I have no information whether flocks are still to be found in either of those islands.

In the Levant fat-tailed sheep are represented

by a breed stated by Fitzinger to be the result of crossing the Bokharan fat-tail with the Circassian long-tailed sheep. These Anatolian sheep, as they are frequently called, present a marked general resemblance to the Bokharan breed, but are distinguished by the longer and somewhat narrower tail, and especially by the shorter and much finer fleece. The ears, too, are not only narrower and less rounded, but stand out from the sides of the head, instead of being completely pendent. The colour ranges from white to black. This breed is stated by Fitzinger to extend from the Levant into parts of Syria, Mesopotamia, and Turkestan.

In Europe the group is represented by the so-called Macedonian fat-tailed sheep, stated by Fitzinger to have nearly the same origin as the last, being the result of a cross between the Bokharan fat-tailed and the Colchian long-tailed breed. It apparently differs from the Levantine breed merely by the more wavy character of the long and soft wool. This breed, which was introduced at an early date into Macedonia, and spread thence into Sicily, southern and central Italy, Sardinia, and Corsica, has been known for more than a couple of centuries in the Syrmien province of eastern Croatia, whence it extends into other parts of Croatia, Dalmatia, and southern Hungary. This stock was introduced by certain Illyrians, who emigrated from Macedonia in the year 1690, taking

with them one hundred of the best and finest-woolled of these sheep, which they brought to Syrmien. These were carefully tended, with the result that the breed was firmly established in this part of Eastern Europe. Early in the nineteenth century the breed extended into Hesse.[1] These sheep are chiefly valued for their abundant fleeces of fine, although short, wool.

In Naples these sheep are known as *pecare moscie*, in allusion to the "woolly" character of their broad and fat tails.

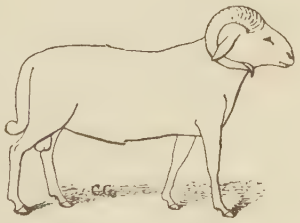
Fat-tailed sheep are found in North Africa from Morocco to Egypt, and have been divided into three breeds—the Barbary or Algerian, the Tunisian, and the Egyptian—although it is not easy to formulate distinctive characters for these. Writing of all these collectively, Colonel Hamilton Smith states that, as compared with other broad-tailed breeds, they are more rufous on the neck, legs, tail, ears, and nose. The wool is long and coarse and the chaffron not much arched; while the ears are pendulous, and the horns of the rams somewhat like miniatures of those of the wild urial. The tail, which reaches about to the hocks, is broader at the base than the buttocks, and is carried with the tip projecting forward between the hind-legs.

Tunisian fat-tails were introduced into the United States so long ago as the year 1799, and

[1] Fitzinger, *op. cit.*, p. 175.

have bred there ever since.[1] The tail is usually docked at an early age, and the horns of the rams have been eliminated by selection. These sheep attain considerable bulk, rams weighing 150 lbs. or more, and ewes about 120 lbs. Although they produce good fleeces, the variable colour detracts from the value of the wool; and these sheep are mainly esteemed for the excellent quality of their mutton, their early breeding, and their fecundity. Their prolific nature is indicated by the fact that twins are comparatively common, and that, under favourable climatic and other physical conditions, the ewes will breed twice a year. Flocks of Tunisians are also maintained in South Africa and Australia.

The Egyptian fat-tailed sheep, which is nearly allied to the Tunisian and Moroccan breeds, is of interest on account of being the ordinary domesticated sheep of Egypt during the Pharaonic period. In the existing breed the ears are partially pendent, and the horns of the rams do not, according to Dr. Fitzinger,[2] attain a large size, generally forming only about one-half of a complete circle. In mummified skulls from Egypt, such as one de-



Outline of Egyptian Fat-tailed Ram.

[1] C. S. Plumb's *Types and Breeds of Farm Animals*, p. 423.
[2] *Op. cit.*, p. 159.

scribed and figured by Messrs. Lortet and Gaillard on page 76 of the second series of their monograph of the mummified animals of ancient Egypt,[1] and others in the British Museum (Natural History), the horns are, however, frequently much more developed, forming rather more than one complete turn, with the axis of the spiral directed mainly outwards. The bony cores on which they are supported present, however, no trace of the longitudinal keel found on those of a pre-Pharaonic breed to which reference is made in the eleventh chapter. The Egyptian fat-tail, for which Messrs. Lortet and Gaillard adopt Fitzinger's name of *Ovis platura ægyptiaca*, is proved by the Egyptian frescoes to have inhabited the Nile valley so early as the XIIth dynasty.

Despite their occurrences in Egypt at such an early date, it may be accepted as a fact that fat-tailed sheep were originally an Asiatic group, and it is likewise equally evident that they entered Africa by way of Mesopotamia and Syria, while it seems highly probable that they were introduced into Southern Europe from North Africa. If this be so, it is clear that the dispersal of this breed was practically identical with that of humped cattle, or zebu, as is likewise their present geographical distribution.[2]

[1] "La Faune Momifiée de l'Ancienne Égypte," *Arch. Mus. Lyon*, vol. ix. Mém. 2, 1907, Moutons. pp. 69–76.

[2] See Lydekker, *The Ox and Its Kindred*, London, 1912.

Back View of Skull and Horns of Egyptian Fat-tailed Ram, from a mummified specimen found at Sakkara, Egypt.

Closely allied to the fat-tailed group are the long-tailed Arabian, Colchian, and Circassian sheep to which the French naturalist Desmarest gave the name *Ovis aries dolichura*. Dr. Fitzinger, indeed, held the opinion that all the types of these long-tailed sheep are distinguished from the fat-tailed group by the much greater length of the tail, which always reaches the ground; but, as we have seen, this appendage may have a similar development in the Africander fat-tailed breed, and it seems evident that the sheep to which Fitzinger[1] gave the name of long-tailed Syrian breed are nothing more than individuals of the fat-tailed Syrian sheep with a similar excessive development of the tail, since the under surface of the latter has the bare area, bordered by longitudinal lateral grooves, distinctive of the fat-tailed group.

In the Arabian, or Bedouin, sheep, on the other hand, the tail, which sweeps the ground, is cylindrical and covered with wool all round. The small and sharply pointed ears are directed laterally outwards, and the head and eyes are likewise of relatively small size, while the degree of convexity of the nose is slight. As a rule, horns are developed in the rams alone. The ears, face, and shanks are covered with short, shining hair, and the body with moderately long, fine, soft, and silky wool. In the matter of colour there is considerable variation, but

[1] *Op. cit.*, p. 180.

as a rule the head, together with the neck, is white and the whole body black—a condition precisely the opposite of that characterising the fat-rumped breeds. Sometimes, however, the forehead alone is white; while self-coloured individuals, ranging in tint from yellowish white to black, are occasionally met with. In addition to carrying horns, the rams differ from the ewes by their longer limbs.

The Arabian long-tailed breed is stated by Dr. Fitzinger to range into Syria, Mesopotamia, Turkestan, Afghanistan, and even North-western India. It is, however, more abundant than elsewhere in the Arabian province of Nejd, where nearly all its representatives are black with white heads and necks. In winter the flocks are kept in the warmest and most sheltered spots, but in summer they are taken to the mountains, or other places where the heat is less intense than in most parts of the plains. The Arabs of Æneze, who cross the desert with their flocks to Damascus and other cities of Syria in order to sell them, return annually to Nejd to buy a fresh stock of sheep and camels. Large flocks of these sheep are also brought into Aleppo; and they are likewise reported to be common in Afghanistan and Sind. Certain small black sheep met with in Abyssinia are believed by Dr. Fitzinger to belong to this breed, and if so, doubtless came originally from Arabia. In many

districts the flocks are kept mainly for the sake of their wool, for which there is a good demand.

From the Arabian breed the Colchian long-tailed sheep differs merely by the rather long and fine wool being curly in place of merely waved. The breed is a native of the province of Mingrelia, in Asiatic Russia, now included in the government of Grusino-Imeritien, but in classical times constituting the land of Colchis, famous for Jason's quest on the *Argo* of the golden fleece. The country is partly mountainous and wooded, although a large area consists of fertile grassy plains on which are reared immense flocks of these long-tailed sheep.

Colchian sheep are kept both for their mutton and their wool; the latter having a great reputation not only in Mingrelia itself, but also in the neighbouring districts. There is likewise a great demand for the skins of young lambs, which are very similar in character to those of the Bokharan fat-tailed breed, and are likewise known in commerce as Astrakhan. The Mingrelians have, however, learnt to preserve the curly character of the young fleece by washing the lambs daily and pressing the locks of hair close to the skin; by which means they are enabled to prolong the life of the lambs for a considerable period, and thereby obtain larger skins. This practice seems to have been known from time immemorial, and was employed by the shepherds of ancient Colchis. The fame of these

fleeces reached ancient Rome from Greece, which was the first country to import Colchian sheep and establish them in Europe. From this trade arose the legend of the golden fleece, and very probably also that of the golden apples, which were really golden melons.

The astrakhan of the Colchian lamb does not appear to be known in the English fur-trade, but a certain quantity of that produced by the lambs of the Arabian breed is imported. Mr. Poland,[1] for instance, after referring to the trade in the skins of the sheep, observes that "the lamb-skins are used for fur-purposes. They are generally black, rather coarse and curly, and are usually sold to Canada for the manufacture of cheap coats. They are generally imported salted, and fetch from about sixpence to a shilling. A few years ago many thousand skins were imported from Bussora, as the fur was supposed to be the same as the Persian lamb, but the result was very disappointing to the owners."

From Greece Colchian sheep were, as we have seen, exported in classical times to Rome, and from these have been produced, by crossing with the ordinary medium-tailed Italian sheep, a breed known as the Tarentinian, so-called from its former abundance in the province of Tarent, in Sicily. In general appearance these half-bred sheep are inter-

[1] *Fur-bearing Animals*, p. 327.

mediate between their two parents, although in the character of their fleece they come nearer the Colchian than the Italian stock. Horns may be present or absent in both sexes. The long pendent tail, which reaches the fetlocks, is regularly covered with long and curly wool; and a thick fleece of moderately long, fine, soft, and curly wool clothes the body. In colour these sheep are either uniformly white or black.

In addition to Tarent, these sheep are also bred in several other parts of Sicily, as well as locally in that portion of Italy which formerly recognised the Pope as sovereign, and even in Tuscany. On the banks of the small brook which now represents the river Galaso, so famous in classic poetry, and flowing into the sea close to Tarent, may still be seen a few of these much belauded white sheep. They have, however, been largely replaced by the half-bred black Italian sheep, of which large flocks graze on the banks of the Galaso. From classic times the shepherds have been accustomed to take some of the flocks to the high mountain pastures in summer, and the practice is carried on at the present day in the neighbourhood of Naples, the fat plains of Apulia forming the winter grazing grounds, which are exchanged in summer for the mountain pastures of the Abruzzo. Some of the flocks remain, however, permanently in the lowlands, with the natural result that their wool is far inferior

in quality to that of their roving brethren. Before Spanish and English wools came into the continental market, that of the mobile flocks of Tarentinian long-tails commanded a high price.

The last representative of the long-tailed group is the Circassian sheep. Both sexes may carry horns, although the ewes are mostly polled: in the rams the horns are nearly smooth on the front surface, and form a shell-like spiral, with the tip directed inwards. The colour of the moderately long, fine, and silky wool is silvery white, with a bluish sheen. In addition to their larger horns, the rams are distinguished from the ewes by the greater length of the tail, which includes from twenty to twenty-two vertebræ.

Flocks of these handsome, long-tailed sheep are kept by the shepherds of the Caucasus, but more especially by the Circassians in Great and Little Kabarda, on the north side of the main range, and also in the vicinity of the Black Sea. They are likewise reared in southern Russia, inclusive of the Crimea, as well as in Little Russia to the south of the Oka; while from southern Russia they extend into Podolia and parts of Poland. By Peter the Great Circassian sheep were introduced into Kazan and Astrakhan; and, as the result of this, a few flocks were to be met with in Fitzinger's time in various parts of the government of Orenburg. These sheep are essentially a mountain breed, and

chiefly valued for their wool, which is of a fine and silky quality. The lambs yield an astrakhan, known in the fur-trade as Ukrainer lamb, which is preserved to an older age than would otherwise be possible by damping and pressing the locks of wool in the fashion referred to under the heading of the Colchian breed.

Of Ukrainer lamb, Mr. Poland,[1] after stating that the skins are about equal in size to those of the Persian fat-tailed breed, observes that "nearly all the skins collected (about 20,000) are black, although sometimes a white spot is found. The price of a skin ranges from three to six shillings; these are usually dyed black in Leipsic. When dyed, the wool, which is short and curly, has rather a dull appearance; it, however, wears well, and for this reason is mainly used for cavalry saddles (officers') in England, although a few of the higher class are employed by furriers."

From what has been written above with regard to the colour of the fleece of the adult, it may be a question whether the words black and white in the above quotation are not misplaced, unless, indeed, the lambs differ from their parents in colour.

[1] *Op. cit.*, p. 331.

FIG. 1

FIG. 2

FIG. 1. Somali Fat-rumped Ram.
FIG. 2. Hedjaz Fat-rumped Sheep.

CHAPTER X

FAT-RUMPED SHEEP

As the fat-tailed and long-tailed breeds display the maximum caudal development, so the fat-rumped group presents us with an example of the extent to which the tail can degenerate. Although these fat-rumped sheep, of which there are two types, distinguished from one another by the nature of the coat, the presence or general absence of horns, and the degree of degeneration of the tail, are markedly distinct from the fat-tailed group, the two are in all probability closely related; the degeneration of the tail in the present group being evidently due to the deposition of fat on the buttocks instead of on that appendage. Pallas regarded fat-rumped sheep as being derived from the wild argali (*Ovis ammon*) of Central Asia; but it is more probable that the urial (*O. vignei*) was the ultimate ancestor of the fat-tailed and the fat-rumped group, both of which were almost certainly differentiated from a common domesticated stock. Nevertheless the fat-rumped sheep was regarded by Fitzinger[1] as a distinct species, under the name of *Ovis steatopyga*,

[1] *Op. cit.*, vol. xxxviii. p. 138, 1859.

although, if entitled to a technical name at all, it should be known as *O. aries steatopyga.*

This sheep, of which there are several local breeds or sub-breeds, is an Asiatic type, of which the range extends from the Black Sea and the confines of Europe throughout Central Asia and the greater part of China and Siberia. Here enormous flocks are kept by nomad Kirghiz, Kalmuks, and Mongols, while in Siberia it is largely bred by the Russians. In China it appears to be almost the only indigenous domesticated breed of sheep. The enormous flocks of sheep kept in the warmer parts of Central Asia consist chiefly of the fat-rumped breeds ; and their abundance is testified by the fact that many of the flocks comprise something like from 10,000 to 15,000 head. In many districts, however, the breed is not pure, but has been crossed with sheep of other kinds, so that there is great variation in the amount of fat on the rump and in the length of the tail.

The typical representative of the group is the Tatarian breed, of which the distributional area extends from the Volga to the Irtish and the Altai range, that is to say, from the Kirghiz steppes to southern Siberia. It is rather a large sheep, with a flat forehead, slightly convex chaffron, the lower jaw shorter than the upper, and moderately long, pendent ears. Although the ewes are nearly always polled, the rams usually carry horns, of which

there may be two pairs. When there is only a single pair, the horns are thick at the base, from which they rapidly narrow to the tip, forming a double snail-like spiral on the sides of the head; when horns are developed in the ewes they form only a half-circle. The throat is furnished with a distinct dewlap, extending downwards to the chest. The most distinctive feature is, however, the excessive development of fat on the rump, which takes the form of two great cushions, divided by a median cleft, on the buttocks; the upper surface of these being clothed with wool and hair, while the contiguous inner surfaces are bare. Between these two great fatty cushions is embedded the minute vestige of the tail, the position of which can only be ascertained by feeling with the finger; its skeleton contains only three vertebræ, with a combined length of about $3\frac{1}{2}$ inches. The head, ears, and shanks are clothed with short, smooth hair, which is continued on to the neck, under-parts, and rump with a certain admixture of wool; but the rest of the body carries a fleece of rough, shaggy wool of variable length, mingled in places with hair. Although these sheep are usually uniform white, they may be rusty or dark brown, black, or silver-grey; often, however, the head and ears are black, or white with brown or black patches, and the body white. Frequently also there may be black patches on the shanks, and a long white streak on the back

of the otherwise black ears. The ewes are smaller than the rams; and the lambs, which are born with a distinct rudiment of a tail, are characterised by the shiny, wavy, and doubly curled coat.

The wide steppes on which these sheep are reared are for most of the year dry and comparatively barren, although clothed in spring with an abundant vegetation. At the commencement of summer the flocks are driven to the higher grounds, on which grow various sorts of hard and dry grasses, together with low bushes of the wormwood group, and several kinds of plants rich in soda-salts. In many places are natron-springs, and nearly all the water is more or less brackish. Here the flocks remain throughout the summer, their sojourn being marked by the great increase in the amount of fat they carry, especially on the rump; the maximum development occurring in autumn, when the plants of the wormwood group attain their full growth. Long before winter sets in the flocks are driven south, to find protection in sheltered valleys, where, however, owing to the poorer fodder, and, above all, the diminished supply of salts, all the sheep lose much of their fat. When they cannot get brackish water to drink, they are said to lick up a saline dew which collects on the leaves of the plants during the night in certain districts; all this pointing to the conclusion that salts are the main factor in the excessive development of fat distinctive of this breed. This

is confirmed by the fact that when these sheep are kept in stalls and supplied with fresh water, their fat diminishes rapidly. In a wether in good condition, of which the total weight will be about 200 lbs., the fatty cushions on the rump will weigh from 30 to 40 lbs. In Siberia the development of fat is also less than in other parts of the habitat of the breed. The Kirghiz keep a comparatively small number of rams with the flocks—from 40 to 50 with every thousand ewes. They are firm believers in heredity, and assert that if a well-horned ewe be put to a ram with big horns, the lamb, if a male, will probably be four-horned.

These sheep are chiefly valued for the sake of their flesh and fat, despite the fact that the mutton is far inferior in quality to that of even second-class European breeds. The fat, of which that on the buttocks is semi-fluid and butter-like, constitutes the great bulk of Russian tallow.

In former days the Hottentots of Cape Colony kept a breed of fat-rumped sheep believed to have been derived from the Tatarian stock, which it is suggested may have been imported by way of Persia about the commencement of the seventeenth century. Our only information on the subject is derived from the traveller, J. R. Forster,[1] who met with sheep in South Africa in which the tail was replaced by

[1] See *Observations made during a Voyage round the World, &c.*, London, 1778.

two cushions of fat, and the naturalist Pallas, who saw in Holland tailless fat-rumped sheep reputed to have come from Cape Colony.

Mongolia possesses a breed of these sheep distinguished by its rather smaller size, and the minor development of fat on the rump, as compared with the Tatarian type. The skins of the lambs, which come next in point of quality and beauty to those of the Kirghiz and Kalmuk breeds, form an important source of revenue to the nomad Mongols.

The steppes of Dauria are the home of a breed of tailless fat-rumped sheep reported to be the largest not only of this particular group, but of all domesticated sheep, although measurements do not appear to be available. The breed is further distinguished by the small development of the fatty cushions on the rump, which are frequently not larger than two fists and do not weigh more than 10 lbs., and to some extent also by the finer wool, which is much less mingled with hair than in the allied breeds. In other respects the Daurian agrees closely with the Tatarian and Mongolian breeds. These sheep appear to be restricted to Dauria, where they are kept in enormous flocks, which feed to a less degree on saline plants and wormwood than the other breeds, thereby accounting for their smaller development of fat. On the other hand, there is abundance of nutritive herbage to serve as food; and this, together with the small amount

of snow which falls in the Daurian mountains, whereby the sheep can remain in the open throughout the year, doubtless accounts for their great bodily size. This may also be the reason for the finer quality of the wool, and the smaller admixture of hair.

The fat-rumped sheep of the nomad Kirghiz is so goat-like in general appearance as to have led Fitzinger[1] to regard it as a cross between the Tatarian fat-rumped breed and the Tatarian goat, although Pallas considered its peculiarities to be due to the effect of climate and food on the Tatarian fat-rumped sheep. It is exceedingly difficult to say which view is right; many sheep being exceedingly goat-like, while, on the other hand, some goats closely approximate to sheep. The long head is characterised by a swollen forehead, separated by a depression from the equally convex chaffron; the lower jaw is frequently longer than the upper; and the ears, although shorter than the head, are long and narrow, with an expansion near the middle, and a forward and outward direction. Ewes are generally hornless, but rams constantly carry horns, which may be two, four, five, or even six in number. When there is one pair, the horns are small, triangular, obliquely wrinkled on the upper surface, and form a half-circle on the sides of the head. The throat and chest have a

[1] *Op. cit.*, p. 172.

dewlap, while on the former are a pair of those pendent tags or lappets which occur in several domesticated breeds of sheep and goats, as well as in some pigs. Their function—if they have any—is still unknown; and it has been suggested that they are merely hypertrophied growths of ordinary skin-warts. In the present instance they are about the thickness of a finger, with a length of a couple of inches or so. The legs are long and slender; and the tail and fat-masses of the same type as in the Tatarian breed, except that the latter are smaller. The thick, moderately long, and not particularly soft, although rugged, wool is so thickly intermingled with coarse hair, that in some cases the fleece might be better described as hairy rather than woolly. Very frequently the colour is dirty yellowish white, but it may be brown or black, while piebald or skewbald individuals are by no means uncommon, and others have the head brown or black, or blotched with these colours, and the body white. In new-born lambs the coat consists of wavy or closely curled hairy locks.

These sheep form the chief support of the nomad Kirghiz hordes, by whom they are kept in enormous flocks. When under Kirghiz owners they are kept in the open throughout the year, but those belonging to Russians in Southern Siberia are stalled during the winter. On account of their abundant hairy fleece, as well as in respect of the

flesh and fat and the skins of the lambs—which form an important article of trade with Russia—these sheep are of the greatest value to the Russians. Together with those of the Kalmuk breed, the skins of Kirghiz lambs are the most valuable of all the members of the fat-rumped group; their pelts, known in Russian as *merluschken*, being noted on account of both the beauty and the durability of the shining and closely curled locks of hair. On this account these skins are nearly as valuable as the true Astrakhan produced by the lambs of the Bokharan fat-tailed sheep; black skins fetching the highest price in the market. The hairy fleece of the sheep is worked up by the Kirghiz into various coloured fabrics; this industry having been in existence at least as early as the classic days of Greece, when it was practised by the Parthians and other tribes.

The Kalmuk breed of these sheep is apparently still more goat-like than the last; this inducing Fitzinger to state that it is without doubt the product of a goat-and-sheep cross, although here again Pallas takes an altogether different view, and believes these Kalmuk sheep to represent a local strain of the Tatarian fat-rumped breed. They are kept in large flocks by the Stafropolish Kalmuks as well as by the middle horde of Kirghiz, by whom they are brought to market at Irtish, whence they are carried to Russia and parts of

Southern Siberia. In appearance these sheep are stated to present a remarkable resemblance to the Tatarian fat-rumped breed on the one hand, and to the Tatarian goat on the other. Although of large stature, they are somewhat smaller, and also more slightly built than the former; and always have the lower jaw exceeding the upper one in length. The colouring of the fleece is much the same as in the Kirghiz breed, and the lambs have a very similar, close-curling, Astrakhan-like coat.

The fat-rumped sheep reared by the Buriatic Tatars of the Lake Baikal district and the Krasnoyarskish nomads of the Yenisei are regarded by Dr. Fitzinger, on account of their general appearance, as the result of a cross between the Kirghiz fat-rumped breed and the Bokharan fat-tailed sheep. Intermediate in point of size between the two latter, the Buriatic breed is characterised by the more frequent presence of four horns in the rams than is the case in any of the allied breeds; the ewes being as a rule hornless, although a few grow horns of the same type as those of the rams but of smaller size. Rams' horns, which are relatively thin at the base, grow to about a foot in length, and form a half circle on each side of the face. When four or more horns are developed, these present considerable individual variation in form and direction. The tail-rudiment is slightly larger than in the preceding breeds, but still forms

merely a small protuberance at the base of the cleft between the two fatty cushions. The latter are relatively small and elongated, hairy above, but bare in their larger lower halves. A moderately long, ragged fleece, composed of soft wavy wool mingled with hair, forms an efficient protection against the winter blasts of the steppes; but on the neck, the lower half of the chest, and the upper and hind part of the fatty cushions, the hair becomes so much more abundant than the wool, that the fleece may be described as hairy. The colour presents the usual gradations from yellowish white to brown or black; parti-coloured individuals being by no means uncommon. The horns are of the normal yellowish hue.

Pallas regarded these sheep as a pure-bred local phase of the fat-rumped type, attributing the small development of the fat-cushions on the rump to the moist mountain-pastures of the Baikal and Krasnoyarsk districts, which carry but few saline plants, and from which salt-licks are absent. The finer character of the wool distinguishing this from the allied breeds is likewise attributed to the same cause.

An altogether different type of fat-rumped sheep is well exemplified by the breeds known as the Somali (pl. xiv. fig. 1), the Hedjaz or Mecca (pl. xiv. fig. 2), the Nubian, and the Persian. For this remarkable type of sheep Dr. Fitzinger[1] pro

[1] *Op. cit.*, p. 182.

posed the name *Ovis pachycerca*, as he considered that it represented a distinct specific stock, although there is not the slightest justification for such an opinion; their peculiarities being such as might perfectly well be the result of long domestication. To distinguish them from the tailless group, they may be collectively referred to as black-headed fat-rumped sheep.

As special characteristics of the group may be mentioned the absence or rudimentary condition of the horns of the rams; the excess in length of the lower over the upper jaw; the strongly developed dewlap, which often extends downwards to the chest; the lack of throat-tags; the short stumpy tail, which appears as a kind of knob between the fatty cushions on the rump; and the short, sleek, shining coat of hair, which is shortest on the face, ears, and tail, and longest on the under-parts. Not less distinctive is the blackness of the head and neck, and the white, with a tinge of yellow, of the body and limbs. The rudimentary horns of the rams, when present, are black, as are also the hoofs; occasionally there may be black patches on the shanks of the legs. In the typical Somali representative of this group the head is small, rather short than long, somewhat high and broad behind, but narrow and bluntly pointed in front. The forehead is highly convex and separated by a transverse trough from the

markedly Roman nose, and the cheeks are laden with fat. The small, short, and sharply pointed ears are upstanding, with a forwards and outwards, or outwards and backwards direction. In length the slender legs are medium; and the hoofs are long and pointed. The rudimentary tail is about a couple of inches in length; and the fat-masses on the rump weigh about 25 lbs.

Dr. Fitzinger[1] was of opinion that Upper Egypt was the original home of these sheep, whence they were carried in early times to Somaliland, and likewise to Arabia, and even Persia, where they became much intermixed with other breeds. There is, however, no native African wild sheep from which they could have originated; and there is no doubt that, like the ancestors of all the breeds found in Africa, they made their way into that continent from Asia. Our first knowledge of the existence of these sheep in Somaliland was due to one Barthema, who came across them in the Seila district; but they remained unknown to naturalists till the year 1827, when an example was described by Isidor Geoffroy, since which date many specimens have been exhibited alive in Europe.

The typical representative of these sheep seems to be the well-known Somali breed (pl. xiv. fig. 1), in which the limbs and under-parts are wholly white and horns normally absent, although one ram in a

[1] *Op. cit.*, p. 184.

photograph sent me by Dr. R. E. Drake-Brockman carries a small pair of horns.

Writing of these sheep, Mr. Brockman informs me that Somalis will not keep any other, or cross these with any other breed, believing that they have reached as near as possible to perfection, so far as the needs of their own country are concerned. And there is doubtless a good deal in this, since not only is the mutton of these sheep excellent, but the skin is more valuable than of any other domesticated breed, while the animals themselves are capable of withstanding severe droughts and can exist on the poorest of grasses.

The Arusi Gallas of Eastern Abyssinia and the neighbouring tribes have a different breed, very similar to the long-tailed Arab domesticated sheep so commonly seen in Aden and Southern Arabia.

According to the same informant, rams of this breed stand from $27\frac{1}{2}$ to $28\frac{1}{2}$ inches at the withers, and from $28\frac{1}{2}$ to $29\frac{1}{2}$ inches at the croup, the corresponding dimensions in ewes being $24\frac{1}{2}$ and $26\frac{1}{2}$ inches. In rams the weight may be as much as from 99 to 118 lbs., while in ewes it is not more than about 78 lbs.

Several thousand head of these Somali fat-rumped sheep are shipped weekly from the coast towns of Berbera, Bulhar, and Zeyla for Aden, where they constitute practically the sole meat-supply of the garrison and other inhabitants. The

skins all go to America, where they are used for gloves.

Near akin to the Somali breed is the Hedjaz or Mecca fat-rumped sheep (pl. xiv. fig. 2), which Dr. Fitzinger classed as a distinct type, and believed to be the result of crossing the pure-bred fat-rumped with the Syrian fat-tailed breed. It is characterised by a slight excess in length of the lower over the upper jaw, the pendent ears, and the moderately short tail, which, owing to its peculiar form, appears more abbreviated than is really the case, and is bare beneath, where it is divided into two fatty moieties by a median longitudinal groove, and has its tip bent backwards. Short as it looks, the tail really comprises no less than fifteen vertebræ, having a combined length of about one foot, but a dozen of these are completely buried between the fat-masses of the rump, which may weigh so much as 30 lbs., and is thus heavier than in any of the other breeds. The ewes are devoid of horns, but rudimentary horns are often developed in the rams. The coat has a certain amount of short, curling, woolly hair mixed with the ordinary hair. In the rams the black of the head extends all over the neck and thence along the under-parts; but in the ewes, which are further distinguished by the smaller development of the dewlap and of the fatty cushions on the rump, it includes merely the sides and the lower surface of the fore part of the

neck, the white area of the back being prolonged along the upper surface of the latter as far as the occiput. The black may extend on to the legs.

Enormous herds of these sheep are kept in the Hedjaz district and other parts of Southern Arabia.

Nubia, Kordofan, and Sennar are the home of a breed of fat-rumped sheep characterised by the development of a short mane on the necks of the rams, and accordingly regarded by Dr. Fitzinger[1] as a cross between the Hedjaz breed and the African maned sheep.[2] As compared with the Hedjaz breed, these sheep are characterised by the greater convexity of the nose, and the deeper channel between this and the forehead, as well as by the constant presence in the rams of short curling black horns closely applied to the head. The dewlap is bigger in both sexes and extends down to the chest; the back is markedly hollow, and the croup less elevated. The tail, which has the same formation as in the Hedjaz breed, and shows a double curve, is freer from the fat-masses, more especially in the ewes, in which it reaches to the middle of the thighs, and is less distinctly divided on the under side into two portions by a longitudinal groove. In the rams a short mane clothes the neck and withers, and in ewes the white of the body frequently extends right along the back of the neck on to the forehead; but in other

[1] *Op. cit.*, p. 187.

[2] Described in chapter xi.

respects the colouring is much the same as in the Hedjaz breed.

These sheep are kept in great numbers by the natives of Nubia, Sennar, and Kordofan, to whom they furnish both mutton and milk.

A more or less nearly allied fat-rumped breed inhabits Madagascar, of which, however, little appears to be known in Europe.

The Persian fat-rumped sheep is, on the other hand, a well-known breed, which has been carried to Cape Colony and Rhodesia, where it is now bred to a considerable extent, although crossed with the Africander fat-tail. Dr. Fitzinger believed it to be the result of a cross between the Somali fat-rumped breed and the Angola long-tailed sheep, but there is nothing in favour of such an origin and everything against it. It is the largest representative of the whole group, and is characterised by its heavy build and a great tendency to the development of fat. The hollow between the chaffron and the forehead is but slight, the upper jaw is distinctly shorter than the lower, the ears are partially pendent, and both sexes are devoid of horns. The neck is short and thick, with the heavy dewlap extending on to the chest; the croup is markedly higher than the withers; and the strong and muscular limbs are relatively long. The not very short tail, which reaches about to the middle of the thighs, and is covered above with rings of short

smooth hair, is coated only at its base with fat, and is elsewhere free; the exposed portion being thick, but narrowing towards the tip. The whole rump is covered with an enormous fatty mass, forming a broad rounded cushion, divided by a median cleft, which is hairy above but naked beneath, where it rests on the base of the tail. Other masses of fat extend from the inner side of the thighs to the groin, while yet others are found on the belly. The coat is entirely hairy, and the black is restricted to the head and neck, as in the Somali breed.

In regard to the sheep of British East Africa, I have received the following communication from the Director of Agriculture at Nairobi:—

"The sheep in the immediate vicinity of Nairobi are those of the Kikuyu. They are a very mixed breed, having been continually influenced by importations of sheep from other tribes. The Kikuyu bush-country is not a sheep-country in the sense that the plain country is, and no special type seems to have perpetuated itself there. In the Masai country near Nairobi, and in other parts, the sheep are a distinct type, being perhaps the best in the Protectorate. They are large, hairy, fat-tailed [? fat-rumped] sheep, and the predominating colour is brown. The tail is short.

"The Suk and Samburu sheep are another distinct type. These sheep are small as compared

with those of the Masai. They are hairy, and the tail is fat and long, coming to a curved point near the ground. The predominating colour is white."

The sheep last mentioned would appear to be a small strain of the lop-eared breed described in the next chapter.

CHAPTER XI

SOME PECULIAR AFRICAN BREEDS

In addition to possessing representatives of the fat-tailed and fat-rumped types, Africa is the home of certain very remarkable breeds of domesticated sheep quite unlike those of any other parts of the world, if we except a few instances in which some of the breeds have been introduced into other countries, where they have in certain cases produced hybrids with the native stock. These African sheep are divisible into three main groups, namely, the lop-eared, the long-legged, and the maned sheep, which Dr. Fitzinger regarded as representing as many species, under the respective names of *Ovis catotis*, *O. longipes*, and *O jubata*, although there is little doubt that they are nothing more than highly specialised forms of *O. aries*. Among the features indicative of specialisation in these breeds may be noted the frequent loss of the horns in the rams (as well as in the ewes), the replacement of the wool by hair, the development of tags or wattles on the throat, and the convexity of the nasal region, or chaffron; the length of the tail, which in some

FIG. 1

FIG. 2

FIG. 1. Egyptian Lop-eared Ram.
FIG. 2. Guinea Long-legged Ewe.

cases may touch the ground, is likewise a specialised character. In connection with the hairy nature of the coat in some of these breeds, it is important to mention that although this must be regarded as a specialised feature, it is really a reversion to the condition obtaining in the wild mouflon, due, it may be, to climatic influences.

Although all these breeds are now mainly or exclusively African, they are not to be regarded as the descendants of wild ancestors indigenous to Africa, but are to be considered as of Asiatic origin ; there being no evidence that Africa ever possessed any species of wild sheep except the arui of the northern provinces, which represents a type widely different from ordinary sheep, and a Pleistocene Algerian species.

In addition to the three groups just mentioned, the present chapter contains an account of a piebald and frequently four-horned sheep which there is considerable reason to believe originally came from Africa.

Perhaps the most remarkable of all these breeds is the one to which Leo Africanus[1] gave the name of Adimain sheep, but which may be better known as the lop-eared breed—*Ovis aries catotis*, if a scientific designation be considered desirable.

In size these remarkable sheep (pl. xv. fig. 1) are much larger than the fat-rumped breeds, and

[1] *Descript. Afric.*, vol. ii. p. 752.

in make they are more like the under-mentioned long-legged breeds. Compared with the latter, they are, however, at once distinguished by the higher and less elongated head, the markedly shorter limbs, the thinner and deeper body, the much greater length of the tail, and the rough and shaggy coat. The head, which is always carried high, is large and deep, with the highly convex forehead passing uninterruptedly into the equally vaulted chaffron, and the lower jaw longer than the upper one. The eyes, which are not far removed from the base of the ears, and are of medium size, are placed high on the sides of the head; while the long lopping ears, of which the length considerably exceeds half that of the head, reach below the sides of the latter. Their drooping ears and the complete absence of horns in both sexes, coupled with the highly vaulted profile of the face, render these strange sheep remarkably like the Theban goats of the same country, except that the latter have much shorter tails.

Although there are no tags, the throat carries a well-developed dewlap, which is continued on to the chest. A marked feature of this breed is the excess in height of the croup over the withers; and the moderately long limbs are slender but strong, with stout, blunt hoofs. The long, thick, deeply set tail, which hangs straight down from the buttocks, so that its terminal hairs touch the

ground, is covered with long tangled wool, forming a kind of tuft at the tip.

The face, ears, and shanks of the legs are covered with short, smooth-lying hair, whereas the upper portion of the limbs and the whole body are clothed in a thick fleece of long, soft, woolly hair, which forms a more or less distinct parting down the back and hangs down below the belly; beneath this is a coat of short wool, or wool-like hair. The colour is often uniformly dark reddish brown, with a more or less well-marked tinge of yellow; but according to Dr. Schweinfurth,[1] who gives a figure of one of these sheep, it is frequently white, except on the muzzle, round the eyes, and the legs, where there are black patches.

Lop-eared sheep are bred in large numbers in Upper Egypt, Nubia, and the Eastern Sudan, more especially in the neighbourhood of Assuan, where enormous flocks are kept by the Bisharin. They are more numerous in the plains than in the hills, and are of great value to the natives; whom they supply with flesh, milk, wool, and leather.

As already mentioned, they were first made known in Europe by Leo Africanus about the year 1500; and in the second half of the eighteenth century specimens were seen in Holland by Pallas, which appear to have been brought from Libya by way of Morocco, and were accordingly described by

[1] *Im Herzen von Afrika*, vol. i. p. 37, Leipzig and London, 1874.

him as Moroccan sheep. In 1885 a single example was brought to Schönbrunn by the Austrian traveller and naturalist Heuglin, which was examined by Fitzinger.[1]

In the opinion of the latter writer three European sheep are the result of crossing the Libyan lop-eared sheep with the native breeds of the countries in which they occur. The first of these is the Bergamo breed, of the warm valleys of Upper Italy, more especially the provinces of Bergamo and Como, and the neighbouring parts of Lombardy, where they are kept in large flocks. The ancestors of these sheep were probably imported into Italy from Africa in Roman times, and crossed with the ordinary local breed. In general appearance and their large size they are more like their African than their European parents, although in certain respects they come nearer the latter. The general shape of the head and the drooping ears conform essentially to the African type, but in some instances the rams are horned; the thin tail reaches the hocks. Although the usual colour of the thick shaggy fleece is dirty white, it is not infrequently a lighter or darker shade of brown, sometimes with a rufous tinge and occasionally dull chestnut. The rams are much bigger than the ewes.

In Lombardy, where they may include as

[1] *Op. cit.*, vol. xli. p. 195, 1860.

many as a thousand head, the flocks are driven in summer to the mountain pastures, where they remain at a high elevation till autumn, sometimes crossing into the Swiss Alps. Their yield of wool is heavy, the fleece weighing in some instances so much as 7 lbs.

The Paduan lop-eared sheep, which is kept in large flocks not only in Padua but in the valleys of neighbouring districts, is a nearly allied breed, produced, it is believed, by crossing the African lop-ear with the merino. In general characters this breed appears to be very like the last, the rams occasionally developing horns, and the colour of the fleece ranging from dirty yellowish white through reddish brown to black. The flocks, which are treated in the same manner as those of the Bergamo breed, are chiefly valued for their wool, which, doubtless owing to the merino cross, is of high quality; but there is also a large trade in the mutton, while the ewes furnish excellent milk, which is extensively used in cheese-making. In former days, before the advent of the merino, the Paduan breed was also cultivated in parts of Austria, Franconia, and Würtemberg.

A third lop-eared breed takes its name of Münster sheep from the district of Münster in the Prussian province of Westphalia, where it was at one time bred in large numbers. Except that it is particularly suited to dry soils, nothing of import-

ance appears to be recorded with regard to this breed.

A very characteristic African type is the long-legged sheep, to which the French naturalist Desmarest gave the name *Ovis aries longipes*, although it was subsequently raised by Fitzinger[1] to the rank of a distinct species, with a number of local breeds, such as the Guinea, Congo, and

Skull and Horns of a Fezzan Long-legged Ram, from Morocco.

Fezzan sheep. In general appearance, as well as in many details of form, these sheep are exceedingly like some of the lop-eared breeds of goats. The distinctive features of the more typical breeds are to be found in the long, broad, pendent ears, closely applied to the sides of the head; the great length of the limbs and the large bodily size; the moderately long tail, which reaches about to the

[1] *Op. cit.*, p. 203.

hocks; the outward direction of the horns of the rams, when these are fully developed, and the hairy coat, but very sparsely mingled with wool, which varies in length in the different breeds, and is frequently elongated into a ruff or frill on the throat of the rams. The colour is very generally black and white, but the black may be replaced by brown or chestnut.

Cuvier was of opinion that these sheep are descended from the wild North African arui or udad; but Fitzinger remarked that the absence of tear-pits in the latter is sufficient to show that this is not the case, his opinion being subsequently endorsed by Messrs. Gaillard and Duerst.[1] There can, indeed, be little or no hesitation in regarding long-legged sheep as derived from the same Asiatic wild stock as that which gave rise to so many of the other domesticated breeds. Next to the lop-eared and fat-tailed breeds, they are the largest of all tame sheep.

The headquarters of long-legged sheep are the districts extending from Fezzan and Tripoli through Morocco, Senegambia, and Guinea to Damaraland, Namaqualand, and Angola; but they also range into part of the Eastern Sudan, and in pre-Pharaonic times were found in Egypt. They have, however, been transported not only to other parts

[1] *Vide* C. Gaillard, "Le Bélier de Mendés," *Bull. Soc. Anthrop. Lyon*, 1901, p. 22.

of Africa, but likewise to Persia, the East Indies, China, and even the West Indies, Guiana, and some of the islands of the South Seas.

The typical representative of the group is the Guinea long-legged sheep, which occurs not only in that country, but also in Damaraland and Namaqualand. Among the characteristics of this breed may be mentioned the slight convexity of the forehead, which is separated from the highly vaulted chaffron by a distinct depression, the approximation of the eyes to the ears, the completely pendent character of the latter, which are about equal to half the length of the head, and the general presence of short, thick horns in the rams. From the short and thick neck depends a distinct dewlap, but there are typically no lappets or tags, and a long ruff is developed on the throat and chest of adult rams. The tail, which has an incipient tassel of long hairs at the tip, reaches slightly below the hocks. Except on the throat, the coat is short and smooth. There is much individual variation in the matter of colour, but the majority of these sheep appear to be either piebald or skewbald, uniformly yellowish white, reddish brown, greyish brown, or black examples being less common. Very frequently the head is white with a large black patch on each side, the greater portion of the neck and the fore part of the body black, and the hind-quarters white with

a single large black patch; but in other cases the head is black or reddish brown, and the body irregularly marked with dark blotches. The horns range in colour from horn-colour to blackish.

In their native country these sheep are kept in large flocks alike in the plains and in the mountains, for the sake of their flesh, milk, and hides, as they yield no wool. Early in the seventeenth century these sheep were carried by the Portuguese to the northern districts of Brazil, while about the same time, or perhaps still earlier, they were introduced by the Spaniards into the West Indies and Guiana. At a later date they were acclimatised in Persia, the East Indies, China, and some of the islands of the South Pacific. A century or so ago these sheep were commonly shown in travelling menageries, in which some are stated to have interbred with the mouflon. Their native name in Upper Guinea is *emmema*.

The West Indian breed, from which the Brazilian is probably inseparable, is stated by Fitzinger[1] to differ from the Guinea type by the constant lack of horns in the rams; but a mounted specimen in the Natural History branch of the British Museum is further distinguished by its small upright ears, as well as by its uniformly foxy coat and the absence of a throat-ruff. Possibly the pricked ears may be a late development. A breed of these

[1] *Op. cit.*, p. 209.

sheep which was at one time reared in Cape Colony in considerable numbers may either have been introduced by the natives from Namaqualand or transported by sea from Guinea. It appears to have differed in no important feature from the typical representative of the group.

In Persia long-legged sheep of the Guinea type appear to have been crossed with the indigenous black-headed fat-rumped breed, and thus given rise to a hybrid stock which displays its African parentage in respect of its large bodily size and general appearance, but in the presence of fatty cushions on the rump and in colouring exhibits equally marked signs of affinity with its Asiatic ancestor.

In addition to the typical long-legged breed, Guinea is also the home of a closely allied sheep (pl. xv. fig. 2) distinguished by the presence of lappets or tags on the throat, and for this reason regarded by Fitzinger[1] as a hybrid between the former and the under-mentioned Congo long-legged sheep. It is further characterised by the larger size of the ears and the smaller development of the horns in the rams. These sheep appear to be always parti-coloured, the markings generally taking the form of large yellowish or reddish brown or black blotches and patches on a dirty white ground; the distribution of the markings being

[1] *Op. cit.*, p. 217.

irregular. As a rule, the head is white, as are the shanks and most of the lower half of the tail; the small growth of woolly hair being grey. The horns and hoofs are blackish.

The aforesaid Congo sheep, which was regarded by Dr. Fitzinger[1] as a cross between the long-legged Guinea breed and the Theban goat, under the name of *Ovis longipes congensis*, is a very distinct type, characterised by its goat-like appearance and large stature. In both sexes the head is strongly and uniformly convex from forehead to chaffron; but only the rams bear horns, which are small, short, and rather thin. The throat is furnished with a distinct dewlap, and likewise with a pair of cylindrical lappets or tags, and in old rams develops a fringe of long hairs. The body is short, with the withers higher than the croup; the legs are long and stilt-like; and the comparatively long and thin tail, which reaches considerably below the hocks, is clothed for the greater part of its length with short, close-lying hair, but towards the tip carries a longer growth which tends to form a tuft. The coat consists of very similar short hair, which becomes somewhat elongated on the fore part of the neck, as well as on the throat and dewlap. The colouring is variable, but generally more or less distinctly pied with various shades of brown and blackish on a greyish ground; the sides

[1] *Op. cit.*, p. 211.

of the head, the region above the eyes and round the horns, as well as the fore part of the upper side of the neck and the chin, being, however, frequently blackish, while the under side of the neck and the fore part of the breast are chestnut. In other cases the ground-colour is white, upon which are large irregular blotches of rufous brown.

These sheep are kept in large numbers by the natives of Lower Guinea and the Congo, whom they supply with mutton, milk, and leather. They are stated to have been carried at an early date to the East Indies ; and when Captain Cook discovered the island of Sabu, near New Guinea, the natives were found to be in possession of sheep apparently referable to this breed.

A nearly allied type is the long-legged Nigerian or Hausa sheep (pl. xvi. figs. 1 and 2), which appears to have been unknown to Fitzinger, but was named *Ovis longipes carnapi* by Dr. J. Müller-Liebenweide[1] in 1896, from specimens then living in the Berlin Zoological Gardens. Examples have since been exhibited in the London and Dublin Gardens, the former of which are now mounted in the British Museum (Natural History).

These sheep are typically characterised by the great development of the throat-fringe of the rams, the strongly pronounced Roman profile of the entire head, the long, drooping ears, the presence

[1] *Illustrirte Zeitung*, Berlin, 1896, p. 789.

FIG. 1

FIG. 2

FIG. 1. Head of Nigerian Long-legged Ram.
FIG. 2. Nigerian Long-legged Ewe.

of a pair of hairy cylindrical tags or lappets on the throat, the slender elongated limbs, the long hairy tail which reaches below the hocks, and the rather long shaggy coat, marked with blotches of black, brown, or fawn on a glistening white ground. Whereas the ears of the rams are completely pendent, those of the ewes are stated to be in some cases directed partly outwards. The rams alone carry horns, which are of considerable length, and directed almost immediately outwards; these, when fully developed, making about one complete turn. Not infrequently the head, with the exception of the muzzle, and fore-quarters are black, while the remainder of the body is white; but there is considerable variation in this respect, and in some cases the head is mainly white, with a large black patch on each side enclosing the eye. In some instances the throat-tags may be absent.

One of the best-known representatives of the group is the Fezzan long-legged sheep, the *Ovis longipes libyca* of Fitzinger, of which the range extends from Tripoli, Fezzan, and Tibbu through Morocco and Algeria to Senegambia; while in Nubia and Sennar is found a half-bred strain, which may extend into Abyssinia. In general appearance the Fezzan sheep appears to resemble the Nigerian breed, having a long rough coat, but it is distinguished by its inferior bodily size. The head, ears, and shanks of the legs are clothed with short,

smooth-lying hair; but the hair on the body is long and shaggy, attaining its maximum length on the withers, where it forms a pronounced whorl, from which proceed lines of long hair on to the throat. The colour is generally yellowish white, with large irregular black blotches; the jaw being white, with a large elongated black patch on each side, which includes the eye and ear. The tail is mostly black, and there are generally black blotches on the limbs. The horns are brownish horn-colour.

In pre-Pharaonic times Egypt was the home of a breed of long-legged sheep closely allied to the foregoing. Of this breed, which is represented in some of the earlier Egyptian frescoes, such as the one here reproduced,[1] Mr. C. Gaillard writes as follows in his above-quoted article on *Le Bélier de Mendés*:[1]—

"The Mendés sheep of the Memphitic period, the domesticated sheep of Neolithic Egypt, although nearly related to some of the breeds of long-legged sheep of Guinea, Morocco, and Fezzan, differs from all of them in certain physical characters. On the other hand, the comparative study of the bones found at Toukh and of skulls of the recent *Ovis longipes* does not reveal any specific difference between these two sheep. Mr. Duerst and myself have accordingly arrived at the following conclusions:—

---

[1] *Vide supra*, p. 219.

"The fragments of skulls discovered at Toukh correspond in general form with the skull of the existing long-legged sheep; the slight differences between them not exceeding the limits of individual and sexual variation. The Egyptian sheep belongs to the species *Ovis longipes*, Fitzinger. We have proposed to designate the sheep with horizontal horns as *O. longipes palæoægyptius*, with the following racial characters: horns directed horizontally

Ancient Egyptian Long-legged Sheep, from a Fresco on the Tomb at El-Bersheh, Egypt.

and transversely, with a slight spiral twist; horns present in both sexes; the rams frequently with a throat-fringe."

The author then goes on to state that these long-legged sheep were domesticated during the Neolithic age, when the use of metal was unknown, and that they survived till the commencement of the Pharaonic epoch, after which date they were replaced by the Egyptian fat-tailed breed. It is added that these sheep were evidently of Asiatic origin.

In this connection reference may be made to the Egyptian illustration of a sheep's head shown in the text-figure on page 16. This picture,[1] as already stated, was provisionally regarded by Dr. Shipley as that of a four-horned sheep, in which the upper pair of horns had been artificially moulded into an abnormal shape; but, as I have pointed out,[2] it would appear to be a composite, the upper pair of horns being those of the long-legged sheep, and the lower ones, which are of the Ammon type, those of the fat-tailed breed. Possibly, indeed, this figure may be symbolical of the supersession of the pre-Pharaonic long-legged breed by the fat-tailed sheep.

From the accompanying text-figure it will be seen that some of these sheep were blotched with black in the same manner as many individuals of the modern long-legged breeds; while others were uniformly coloured, being either black or of some lighter colour. As regards the length and direction of the horns, there is little or no difference from some examples of the modern Nigerian long-legged breed. Personally I am very sceptical as to the ewes being horned; there being nothing to show that all the individuals depicted in the accompanying illustration, and in such other figures as have come under my notice, are not rams.

[1] *Country Life*, March 23, 1912.
[2] *Ibid.*, March 30, 1912.

Later on Mr. Gaillard suggests that the Prehistoric long-legged sheep may have been the parent form of the zackel-sheep, referred to in chapter v., remarking that the latter may have been the product of crossing the former with the Egyptian fat-tailed breed. This view was based to a considerable extent on the belief that the zackel-sheep was a native of Crete, which, as we have seen,[1] is denied by Dr. Keller. Another difficulty is the fact that the zackel-sheep has upright ears, whereas those of the long-legged breeds are pendent. Moreover, if, as Dr. Fitzinger believes, the zackel-sheep is related to the Hungarian rasko-sheep, it certainly cannot have any near affinity with the long-tailed breeds.

One of the most remarkable of all domesticated breeds is the so-called zunu or goitred sheep of Angola, which has been named *Ovis steatinion*, or *O. longipes steatinion*, and of which a good description and figure were given by Colonel Hamilton Smith in Griffith's *Animal Kingdom*.[2] By Dr. Fitzinger[3] this breed was suggested to be the result of a cross between the Congo long-tailed and the Malagasy fat-rumped sheep, but there is not a tittle of evidence in favour of the second element in this mixed parentage.

In many respects this sheep resembles the long-

[1] *Supra*, p. 138. [2] Vol. iv. p. 327.
[3] *Op. cit.*, p. 215.

legged Congo breed. Not excessively tall in stature, it is specially characterised by the peculiar conformation of the head, which is of moderate length, and terminates in a rather low, sharply pointed muzzle, with the lower jaw slightly shorter than the upper one; the forehead being highly convex and separated by a deep depression from the moderately swollen chaffron. Near the occiput is a large fatty mass, which forms a prominent cushion reaching to the ears; the cheeks are likewise inflated with fat, and a largish goitre-like deposit of fat occupies the lower part of the throat. The ears are of the pendent type characteristic of the present group, and about equal in length to half the head. The rams alone carry horns, which are very small, crescentic in shape, and almost smooth, except near the base. Although not shown in Hamilton Smith's figure, tags are stated to be present on the throat, which carries a heavy dewlap, extending downwards to the chest. The unusually long and rather slender tail, which reaches at least to the fetlocks, is covered throughout the greater part of its length with short, smooth-lying hairs, but carries somewhat longer ones near the tip. Similar short hairs clothe the head, ears, and shanks, but the remainder of the skin is covered with a rather longer and looser glistening coat, which attains its maximum development on the neck. The neck, back, and flanks, together with the ears and the upper surface of the

tail, are bright reddish brown, in sharp contrast to which is the white of the head, throat, under-parts, legs, and lower side of the tail.

So far as is known, goitred sheep are restricted to the West African province of Angola, where they are kept in large flocks for the sake of their flesh, milk, and hides, and are known to the natives by the name of zunu. Fitzinger states that some time prior to 1860 a small number of these sheep were introduced into Persia, where they were crossed with the native breeds.

Under the name of the maned Fezzan sheep Dr. Fitzinger[1] described a breed which he believed to be the product of crossing the long-legged Fezzan with the under-mentioned maned sheep. A native not only of Fezzan, but of Nubia and Sennar, this sheep is described as being somewhat inferior in size to the Fezzan sheep, but not so small as the maned sheep. The head resembles that of the former, although with a less prominently Roman nose; and the horns of the rams are of moderate size and form, without rising above the level of the head, a well-marked spiral directed downwards, forwards, outwards, and backwards, with a distinct downward trend at the tips. The limbs are of medium length, and the tail very similar to that of the long-legged Fezzan breed. A distinctive feature of the coat is the presence on the withers of a

[1] *Op. cit.*, p. 222.

whorl of long hair, in advance of which the whole neck is clothed with long hair; this forming in the rams a distinct mane, which falls well below the chest. As a rule, the head, inclusive of the ears, the whole neck, and the fore-part of the mane are black, while the rest of the body is white; but the black areas are not infrequently replaced by brown or rufous.

In this place reference may be made to a small brown ram exhibited in the British Museum (pl. xvii. fig. 1), and reputed to come from Abyssinia, which apparently represents another hybrid between the long-legged and the maned sheep. It has outwardly directed horns of the type of those of the long-legged group, but is much inferior in point of size and shorter in the legs than any of the members of the latter, while it shows a distinct mane on the neck; the whole coat being relatively long and shaggy. The shortness of the tail in this particular specimen is perhaps due in part to imperfection, although the relative length is not much greater in a dwarf sheep from the Cameruns referred to below.

To a breed of sheep from the Sudan Linnæus gave the name of *Ovis aries africana*, a designation which was unjustifiably changed by Fitzinger[1] to *Ovis jubata*, in allusion to the heavy mane developed on the neck of old rams. It was subsequently con-

[1] *Op. cit.*, p. 224.

PLATE XVII

FIG. 1

FIG. 2

FIG. 1. Abyssinian Half-bred Long-legged and Maned Ram.
FIG. 2. Black Baluba Maned Ram.

founded with the long-legged group, especially with the Guinea breed, to which it is evidently nearly related, although, as was pointed out by Fitzinger, considerably inferior in size, and also much lower in build, while it also has horns of the Ammon type. By an apparent misunderstanding of the account of this breed given by Fitzinger, Mr. Gaillard[1] has stated that Fitzinger himself regarded this sheep as the product of a cross between the long-legged and the fat-rumped breeds.

The maned sheep is described by Fitzinger as being of medium size and not much bigger than the ordinary European breeds. In the moderately long head the swollen forehead is separated by a depression from the somewhat convex chaffron, the upper and lower jaws are of nearly equal length, and the ears, which are less than half the length of the head, are bent outwards and downwards. The rams alone carry horns, which are rather short, triangular, thick at the bases, and then sharply narrowing to the blunted tips, with oblique ridges across the greater part of the front surface. From their widely sundered bases they curve, without rising above the level of the head, laterally to form a gentle arch from back to front, so that their tips incline at first inwards and then slightly outwards.

From the lower part of the throat depends a

[1] "Le Bélier de Mendés," p. 34.

dewlap, which extends on to the chest; the withers are higher than the rounded croup; the legs are of medium length and strong and stout build; and the rather thin and evenly haired tail is about a foot long and reaches nearly to the hocks. On the face, ears, and limbs the coat is very short and close-lying; but on the occiput the hair becomes longer, while on the neck, withers, and chest it forms in old rams a heavy mane or mantle; in ewes the mane is scantier and shorter. A change of direction in the lie of the hair on the withers is indicated by a pronounced whorl. The horns are of the curling mouflon-type, and thus quite different from the outwardly directed ones of the long-legged breed.

Fitzinger states that the colour is either piebald or skewbald, with a sharp demarcation between the light and the dark areas. In piebald examples the head, neck, mane, and lower parts of the limbs are usually black; while the body and such portion of the mane as hangs below the breast are white, with a slight tinge of yellow. The horns and hoofs are black.

The headquarters of this breed are the Eastern Sudan, where these sheep are abundant in the countries inhabited by the Dinkas, Nuers, and Shilluks, and in fact all along the valley of the Bahr-el-Abiad, or White Nile. They have, however, spread from this region through the Tan-

ganyika district, and so on to Angola, Guinea, Senegambia, and even Morocco.

An excellent figure of a couple of adult rams of the Dinka breed of these sheep is given by Dr. G. Schweinfurth,[1] who writes as follows :—

"The distinctive mark of these Dinka sheep consists in the mane-like covering of the withers, chest, and neck—the rest of the body being short-haired—and the thin tail. This mantle of hair sometimes gives to the Dinka sheep the appearance of a miniature buffalo, a resemblance intensified by the plumpness of the body and the comparative shortness of the limbs. For the most part these sheep are pure white, more rarely blotched with brown or black, and in some cases wholly reddish brown. . . . Like the shepherds of South Africa, the Dinkas are in the habit of splitting the newly sprouting horns of these sheep in order to make them grow double in the adult."

The British Museum (Natural History) possesses one of these reddish brown rams of the Guinea race of the maned sheep, the only variation in the colour being that the face is paler. It was presented by the Zoological Society in 1850.

In the same collection is a small black ram with a white patch on the nape of the neck, and a heavy black mantle on the fore-quarters, which was obtained at Luebo, on the Lulua River, to

[1] *Im Herzen von Afrika*, 1874, vol. i. p. 174, Leipzig and London.

the west of Lake Tanganyika, by Mr. F. Torday, by whom it was presented to the Museum in 1909. This Baluba ram, as it appears to be called (pl. xvii. fig. 2), evidently represents a local breed of maned sheep. Its black horns curve forwards by the side of the face in mouflon-fashion, and are thus quite different from those of the long-legged sheep. The height of this ram at the shoulder is about 24 inches.

In a skull of an older ram of the Guinea breed in the collection of the Museum (No. 58.5.4.24), from the Zoological Society's Gardens, the horns are considerably longer, forming one complete turn of a spiral.

The Angola representative of the maned breed appears to be a cross between the typical maned and the typical long-legged sheep, being intermediate in point of size and appearance between its two supposed parents. The colour is white with large blotches of rufous, and, as a rule, a large round black patch in the neighbourhood of the eyes.

In their native land, where they are known by the name of coquo, these sheep, which are much better proportioned than the long-legged breed, are kept in enormous herds, and supply the natives with milk, mutton, and leather.

The Muana-coquo of the Angolanese is an allied breed ranging from Angola to Senegambia, and distinguished by the presence of wattles or tags

on the throat, which led Fitzinger to believe that it represented a cross between the ordinary maned sheep and the wattled long-legged breed. There is considerable variation in colour, but as a rule the under-parts and upper portion of the legs are pale yellowish fawn, as is also the head, with the addition, however, of dark markings; the mane on the lower side of the neck consists of a mixture of reddish yellow and grey hair, but on the upper side is almost wholly grey; the short-haired portions of the limbs are dark yellowish brown inclining to rufous, sometimes with light spots near the hoofs; and the tail is mainly a mixture of yellowish fawn and white. Less commonly the head, mane, limbs, and presumably the under-parts are black or reddish brown and the remainder of yellowish fawn or yellowish white.

According to Fitzinger[1] the Senegal or Senegambian maned sheep has been introduced into the East Indies and China, where, as in its native country, it was kept in his time in large flocks. The first specimen brought to Europe seems to have been one exhibited in Paris in the year 1774, under the name of *morvant de la Chine*, which came under the notice of the naturalist Buffon.

Nearly allied to the Senegambian is the Moroccan breed, which seems to be chiefly distinguished by the small size of the half-pendent

[1] *Op. cit.*, p. 231.

ears and the absence of tags on the throat, as well as by the croup being rather higher than the withers. The ground-colour of the body is white, upon which are a few large irregular reddish brown spots, whereas the mane is wholly rufous. Although its headquarters appears to be the Tafilat district, this breed is by no means confined to Morocco, but occurs so far south as Angola, where it is known to the natives by the name of zomba.

A nearly, if not fully, adult ram from the Cameruns exhibited in the British Museum (Natural History) seems to indicate a pigmy and perhaps hybrid form of the maned sheep, as it stands only 19 inches at the withers. The short and thick horns are less than a couple of inches in length. The coarse hair on the body is about an inch long, but that on the neck and throat is elongated into a short mane. Over the greater part of the body the colour of the coat is bright chestnut-red, but the short ears, the greater portion of the face, the throat-ruff, the buttocks, the under-parts, and much of the legs are black. The short, thinly haired tail reaches about half-way to the hocks. The great prevalence of black in this breed is foreshadowed in some individuals of the Senegambian maned sheep, as described above; this blackness of the under-parts being a feature precisely the reverse of the condition existing in the wild mouflon and urial, in which the under-parts are white.

PLATE XVIII

FIG. 1

FIG. 2

FIG. 1. Head of Four-horned Piebald Ram.
FIG. 2. Four-horned Piebald Rams.

The breed now to be described differs from all the foregoing African types in carrying a fleece of curly wool, although resembling many of the members of the long-legged group in its pied colouring, and especially in the general presence of a white blaze down the middle of the face, accompanied by black patches round the eyes, and also in the blackness of the horns. Although there is evidence that some of these piebald and generally four-horned sheep were kept in England so long ago as 1850 (this being exemplified by a head presented to the British Museum in 1901 by the Rev. H. G. Morse), it is very remarkable that no mention is made of them by Dr. Fitzinger in his articles on the breeds of domesticated sheep so frequently referred to in the previous pages of this book.

According to information kindly communicated by Mr. Heatley Noble, of Temple Combe, Henley-on-Thames (to whom I am also indebted for the original of the illustration reproduced in pl. xviii. fig. 2), more than forty flocks are kept by private owners in various parts of the British Isles. Among these flocks it must suffice to refer to those kept by the following owners, viz. the Duke of Devonshire, at Chatsworth, Derbyshire; Sir John Barker, at Bishop's Stortford, Herts; Mr. E. C. Lowndes, at Castle Combe, Chippenham, Wilts; Mr. J. Whitaker, at Rainsworth, Nottinghamshire; Mr. Heatley Noble, at Temple Combe; Lady Cowley,

at Draycot Park, Wilts; Mrs. Farrer, at Ingleborough, Clapham, Yorkshire; Sir H. Dryden, at Canons Ashby, Northamptonshire; and Col. H. Platt, at Gorddinog, Llanfairfechan. There was also at one time a flock on the Duke of Hamilton's Scottish estates.

These handsome sheep are fully as large as Southdowns, and have deep bodies, moderately long limbs, and thick woolly tails reaching at least to the hocks. The head, ears, and the shanks of the legs are covered with short, close-lying hair, while the body is clothed with an abundant woolly fleece. As a rule, the face displays the aforesaid white median blaze, which is generally continued as a broad white band down the chest: the ears and the region round the eyes are black, this black area usually extending to a greater or less extent into the neck and upper part of the fore-quarters. The amount of black on the body is subject to considerable variation; in a ram presented to the British Museum by Mr. Lowndes there are, for instance, only five patches behind the shoulder on the left side, whereas the black predominates in the two rams shown in pl. xviii. fig. 2. The tail seems to be usually, if not invariably, white, as are also the shanks of the legs, except at the fetlocks, where they may be black. In a ram figured in *The Field* of July 6, 1912, the greater part of the body is white; this prevalence of white being, it appears,

a special feature of certain flocks kept in Warwickshire and Northampton.

The horns of the rams differ from those of the Manx and Hebridean loaghtans not only by being generally black in colour, although they may be streaked with yellow, or even wholly yellow, but likewise, in spite of a certain amount of variation in these respects, by their form and direction. In Manx and Hebridean four-horned sheep (pl. iii. fig. 2), for instance, the upper pair of horns have the front surface concave, whereas in the piebald breed it is invariably convex. In some cases the upper (and additional) pair in the piebald breed are directed upwards, outwards, and backwards, as in the ram on the right side of pl. xviii. fig. 2; but in other cases, as in the one on the left side of the same illustration, they sweep boldly upwards, outwards, and downwards. In the fine head shown in fig. 1 of the same plate, presented by Colonel Platt to the British Museum, a somewhat intermediate condition exists. The lower horns may either curve forwards by the sides of the face, as in the ram just referred to, or may be directed more or less backwards. The head of a ram presented to the British Museum by Mr. W. P. Pycraft is of interest as carrying only a single pair of horns, of which, however, the tips are cleft, thus apparently foreshadowing the development of a second pair, and indicating that these sheep were originally two-horned.

Usually the ewes carry a single pair of horns, but in rare instances two pairs are developed; in both cases the horns are much inferior in size to those of the rams.

We are unfortunately to a great extent in the dark as regards the origin of these remarkable sheep, although it is certain that the idea of their being natives of Syria is wrong. The parents of the flock at Ingleborough are stated to have been brought from the Cape about a century ago by the present owner's grandfather, Colonel Farrer, who believed that they had been carried there by Portuguese or Spanish settlers from their own country. Whether the Ingleborough flock, from which the one at Canons Ashby is an offshoot, was originally piebald and four-horned is not recorded; but the Draycot Park flock is reputed to be derived from small black two-horned sheep, with moderately long coats and long tails, of which about thirty were brought from South Africa to England during the last Zulu War. They were probably hairy sheep akin to the black Baluba maned ram mentioned above; and when crossed with four-horned piebalds, the rams increased in size and developed an additional pair of horns. Lambs in this flock are frequently black, with a white blaze on the face, and a white tail; but such black lambs are not produced by most of the other flocks when kept pure.

In *The Field* of July 20, 1912, a writer who signs himself C. E. H. C. states that he possesses a flock of these sheep at Cranleigh, the ancestors of which came from South Africa.

On the other hand, I am informed that there is a belief that the flock owned by Sir Michael Lakin is of Spanish origin; and also that a couple of these sheep were exhibited a year or two ago at the Madrid Agricultural Show. These statements led to my making inquiries on the subject of Dr. Angelo Cabrera, of the Madrid Museum, who informed me that these sheep are quite unknown in Spain. The only Spanish breeds in which the rams normally carry horns are the merino and the Iberian, neither of which is four-horned; the latter being a short-woolled and short-legged sheep, either wholly white or wholly black, but never pied.[1] With regard to Portugal, Dr. Cabrera states that although he cannot furnish absolutely decisive information, he feels sure that the four-horned piebald breed is not indigenous to that country. He adds that he agrees with me in regarding these sheep as of African origin, observing that the presence of examples at an agricultural show in Madrid is of no importance at all, foreign breeds being frequently introduced into the country, either by amateur breeders or by the Agricultural School.

In my own opinion, as expressed in *The Field*

[1] *Vide supra*, p. 136.

of March 30, 1912, the four-horned piebald breed is the result of crossing one or more of the small hairy black, or piebald, and sometimes four-horned native African breeds with a woolly European strain; and it is not a little noteworthy in connection with this theory that the throat of the ram shown in pl. xviii. fig. 1 has a thick fringe recalling the longer one of the black Baluba maned ram. This would account for the replacement of the hairy by a woolly coat, and the great increase not only in the size of the body, but likewise in that of the horns. When or where this presumed crossing first took place, can only be guessed. If it took place in Europe, the hybrid product may have been exported to the Cape, and, after furnishing the source of the Ingleborough flock—presuming this to have been of the modern English type—have eventually died out in that part of the world. Possibly, moreover, such a crossing may have been effected independently on more than one occasion.

CHAPTER XII

THE DIFFUSION OF DOMESTICATED SHEEP

In the course of the preceding chapters it has been shown that, with the exception of the bighorns of North America, which were never domesticated, and the arui of North Africa, sheep are natives of the mountainous regions of Southern Europe and Western and Central Asia, extending southwards to the Salt Range of the Punjab and Trans-Indus districts of India. It has likewise been pointed out that they were in all probability domesticated at a very early period both in Europe and in Asia, and that the Asiatic breed was carried westward by the ancestors of the Prehistoric Swiss lake-dwellers. Reference has also been made to the introduction of some of the European breeds into America, Australia, &c.; this part of the subject may, however, be somewhat more fully elaborated, and in doing this I have drawn largely on the summary given at the conclusion of his articles on the tame breeds by Dr. Fitzinger,[1] who derived much of his information from the writings of Prince Maximilian of Neuwied, Renger, Tschudi, Molina, and Roulin.

[1] *Sitzber Akad. Wiss. Wien*, vol. xli. p. 241, 1860.

As regards the date of the first introduction of tame sheep into South Africa, there is no available information; practically all we know is that sheep of the long-legged breed were kept in Egypt in pre-Pharaonic times, and that these were succeeded by a fat-tailed breed. There can, however, be little doubt that in very early times Africa received the ancestors of all its peculiar breeds from Asia by way of Syria and Egypt, although at a later date there may have been importations into North Africa from Spain and other countries in the south of Europe.

To a great part of South America sheep were first introduced by the Spaniards, who probably for the most part imported the best strains of their native merinos. If, however, this was invariably the case, climatic influences have in many instances greatly modified the original type. In Paraguay, for instance, the native sheep are much smaller than merinos, with short coarse wool, while the flesh is generally of poor quality, deficient in flavour, and nearly white in colour. Flocks of from 100 to 1000 head were at one time common, and the wool was both spun into yarn and woven into ponchos. From its dampness and warmth the climate is, however, ill suited to sheep, and large numbers perish from foot-rot and other diseases.

In Peru the original breed of sheep is undoubtedly of the merino stock, and has departed less widely from the Spanish type than is the case

in Paraguay; this being no doubt due to the elevation of the country and the consequently drier and more salubrious climate. It is, however, very remarkable that the majority of the rams are three or four horned, while others carry five or even six horns, especially when it is borne in mind that merinos show no tendency to such a redundancy in other parts of the world. Like the cattle of the country, sheep propagate at a great rate in Peru; even the smaller farmers never possess less than about 60 to 100 head, while the great land-owners, or estancieros, possess flocks which may number so many as 80,000 head. Sheep are most numerous in the Puna district, where the climate is cooler than on the coast; but in a large area of the mountains the soil is devoted to agriculture, on which account the flocks are largely restricted to the Puna plateau. Sometime prior to 1860 efforts were made to improve the Peruvian breed by the importation of high-class Spanish merinos; and there is no doubt that with proper management the industry might be highly remunerative.

The foregoing remarks are applicable almost word for word to the sheep of Chile, which are from a merino stock imported by Cardinal Ximenes. As in Peru, the rams show a marked tendency to the development of extra horns,[1] the number of these

[1] See Darwin, *Animals and Plants under Domestication*, 2nd ed., vol. i. p. 99.

appendages being in some instances six or seven; in all cases the ewes remain hornless. In other respects the Chilian merinos retain all the characteristic features of their Spanish progenitors, the wool being as fine, long, and soft as in the best strains of the latter, and retaining the beautiful white sheen distinctive of merino wool. In Fitzinger's account it is stated that the Chilian sheep have increased in size and weight, and grow very heavy fleeces, which weigh from 10 to 15 lbs. each; and that the longest and finest wool is the product of the flocks kept on the Cordillera. Improvements in the breed were made about the same time as in Peru by the introduction of fresh stock from Spain.

On the other hand, Messrs. Neveu-Lemaire and Grandidier[1] write as follows with regard to the descendants of the flocks of merino sheep introduced by the Spaniards into the Chilian highlands:—

"The sheep was nevertheless introduced into the mountain countries, and at the present day it is to be found in considerable flocks on the high plateaus mingled with llamas. But the finest breed speedily degenerated, under the influence of altitude and poor nutriment; and in consequence of this the sheep of the high plateaus are as poor and wretched-looking as the cattle. They are small, badly made,

[1] *Notes sur les Mammifères des Hauts Plateaux de l'Amerique du Sud*, Paris, 1911, p. 118.

and of variable colour; some being white, some piebald, and others—and these the most numerous —black."

Merinos are also bred in the small island of Chiloë, off the Chilian coast, and there, too, the rams display the same tendency to a redundant horn-development.

Unlike Chile and Peru, Brazil received its first sheep at the hands of the Portuguese, who at the commencement of the seventeenth century imported long-legged Guinea sheep from the west coast of Africa. Half a century ago this breed was the most abundant and widely spread in the country—as it may be still—having taken as kindly to its new home as did the West African cattle and dwarf goats introduced at the same time. Merinos and other Spanish breeds of sheep have, however, been likewise introduced into various parts of Brazil, while in the southern districts some of the best German breeds were acclimatised at a comparatively early date.

Early in the seventeenth century the Spaniards introduced the Guinea long-legged sheep into the Guianas and West Indies, where, as stated in an earlier chapter, they have flourished exceedingly, and developed into a distinct breed or sub-breed. Attempts have been made to introduce European sheep and cross them with the long-legged breed, which is, however, better suited to the climate, and therefore holds its own.

The sheep first introduced by the Spaniards into Colombia were not merinos, but the ordinary churro Spanish breed, commonly known as the sheep *de lana burda y basta.* They were soon bred in vast numbers on the Cordillera, at elevations of from 3000 to 7000 feet above sea-level. With the possible exception of a slight diminution in size, these sheep seem to show no appreciable modification from their original type. Well as they flourish in the highlands, they are, however, very difficult to maintain in the hot valleys and plains. Here, unless the lambs are shorn at an early period, a remarkable change takes place in the nature of the coat. Unless this is done, the wool becomes loose and falls off in large patches, while on the bare hide, which shows no sign of disease, there grows, instead of wool, shining and close-lying hair, very similar to that of the goats of the same region; this hair never being replaced by wool. In the opinion of Dr. Fitzinger, this change, which was recorded by Roulin, indicates that these Colombian sheep are hybrids between the churro and the West Indian long-legged sheep, but it may apparently be due merely to climatic influences.

North America received its sheep to a great extent through the British, but in part also through the French, and most of the British and French breeds are to be met with in various parts of the United States and Canada, where merinos are

likewise reared to a considerable extent. Incidental mention of the dates at which some of the European breeds were first introduced into North America is made in earlier chapters.

In Australia, where the wool-industry has attained an enormous development, more especially in New South Wales, the merino is the most important breed, being especially well suited to the dry climate. There are, however, other breeds in the country, particularly in New Holland, among them being the ordinary German sheep. In New Zealand, on the other hand, the merino has not attained the same pre-eminence as in Australia, the most numerously represented breed being, as mentioned earlier, the Romney Marsh.

The sheep introduced at an early date into the islands of the South Pacific were mostly of the Guinea and Congo long-legged breeds. The fact that these sheep were already established on an island near New Guinea at the time of Captain Cook's visit has been mentioned in an earlier chapter.

CHAPTER XIII

TYPICAL WILD SHEEP OF ASIA AND AMERICA

As wild sheep form the subject of several works[1] and numerous articles in scientific journals, they are discussed much less fully in the present volume than the domesticated breeds, of which the account given in the preceding chapters is claimed to be unique.

In Asia wild sheep inhabit the Troödos mountains of Cyprus, and the more or less continuous mountain-chains extending from Anatolia on the extreme west of Asia Minor, through Armenia, Persia, Baluchistan, the north-west frontier districts of India, Afghanistan, Bokhara, Turkestan, the Altai, the Pamirs, the Himalaya, Tibet, the Tian Shan, and Mongolia to the Yana and Kamchatka in the extreme north-east. On the American side of Bering Strait they reappear in Alaska, whence they range southwards through the chain of the Rocky Mountains to the highlands of Mexico.

[1] *E.g. Wild Oxen, Sheep, and Goats*, by the present writer, London, 1908. The classification of the sheep there given is somewhat out of date, and an amended scheme, likewise by the present writer, will be found in the sixth edition of Rowland Ward's *Records of Big Game*, London, 1911.

PLATE XIX

FIG. 1

FIG. 2

FIG. 1. Head of Elburz Red Ram.

Their most western representative is the red sheep or red mouflon of Cyprus, Asia Minor, and Persia. On the frontiers of the last-named country and Turkestan we enter the domain of the urial or shapo, which extends into the Himalaya; Central Asia is the home of the argalis, the biggest and finest representatives of the whole group; while in the neighbourhood of the Yana and in Kamchatka we encounter the bighorns, which reappear in North America, where they are the sole wild representatives of their kind. The central Himalaya and Tibet form the home of the aberrant bharal or blue sheep, which forms in many respects a connecting link between sheep and goats.

Commencing with the most western representative of the group, that is to say, the red sheep or Gmelin's sheep, as it is often called (*Ovis orientalis*), it has to be pointed out that this species has been the source of considerable confusion in two distinct ways. Described originally in the year 1829 by the German naturalists Brandt and Ratzeburg[1] as a variety of the European mouflon, under the name of *Ovis musimon orientalis*, it was stated to be a native of the mountains of Persia, the Grecian Islands, Cyprus, and probably the Taurus. And as Persia stands first in the list of localities, it has been very generally considered that the typical representative of the species is a native of that country.

[1] *Medizinische Zoologie*, p. 54, pl. ix., Berlin, 1829.

Closer study of the original description will, however, show that the authors expressly stated that this was based on a Cyprian specimen, and consequently that Cyprus is the typical locality.[1] Owing to lack of recognition of this fact the Cyprian mouflon was described as a distinct species by Edward Blyth in 1840 under the name of *O. ophion*, and was for many years after regarded as different from *O. orientalis*, of which, as we have just seen, it is really the type. It has also been called *O. cyprica*.

The second item of confusion relates to the curvature of the horns. In the first of his articles on the breeds of tame sheep, Dr. L. J. Fitzinger[2] stated that the red sheep differs from the European mouflon by the right horn forming a right-handed, instead of a left-handed spiral. As explained in the third chapter, he not only determined the respective directions of the spirals incorrectly, but he was wrong in stating that the one spiral is right-handed and the other left-handed. Both the mouflon and the red sheep have a right-handed spiral in the right horn, and *vice versâ;* and the difference in their direction is due to what is called a perversion in the twist of the terminal portion. In consequence of this the horns of the red sheep (pl. xi. fig. 2, and pl. xix. fig. 1) are naturally directed backwards behind

[1] This has been pointed out by Dr. N. Nasonov in a memoir, in Russian, on these sheep, published in *Bull. Ac. Imp. Sci. Nat., St. Petersbourg*, 1911, pp. 1267–1296.

[2] *Sitzber. Ak. Wiss. Wien*, vol. xxxviii. p. 156, 1859.

the neck in the fashion which occurs as an occasional abnormality in the mouflon (pl. i. fig. 2). This difference in the direction of the horns affords the most ready means of distinguishing the various races of the red sheep from the mouflon on the one hand, and the urial on the other.[1] Typically, that is to say, in the Cyprian race, the horns have the front outer angle much bevelled off, especially in old age, but this character is less marked in the Persian race. There is likewise scarcely any throat-ruff in the winter coat of the former, although a moderate one is developed in the latter. The ewes are hornless.

The typical Cyprian red sheep, which inhabits the Troödos range of Cyprus, is not larger than the mouflon, standing a little over 26 inches at the shoulder. The front outer angle of the horns is completely rounded off in old rams (pl. xi. fig. 2); and while there is no throat-ruff in the summer coat (*ibid.*), a small dark-coloured one is developed in winter (pl. xix. fig. 2). The general colour of the summer coat is bright foxy red, with some sparse whitish hairs on the sides of the back; but the muzzle, chin, and throat, the inside of the ears, the under-parts, a streak on the buttocks, the inner sides of the legs and the whole of the legs below the knees and hocks are white. The white of the

[1] When the horns of the mouflon have the abnormal curve, other characters must be relied on.

under-parts is, however, divided from the rufous of the body by a broad blackish band, and a spinal stripe on the withers, the tip of the upper side of the tail, a broad streak on the chest, the part of the fore-legs above the knees, and a patch on the thighs are likewise blackish or black. The outer side of the ears is grey.

In the winter coat (pl. xix. fig. 2) the development of a short dark throat-ruff obliterates the white in this region; but, as if in compensation, a conspicuous whitish saddle-patch makes its appearance, at any rate in rams of the age of the one represented in the plate. The general colour of the coat is also browner. At all ages the direction of the horns is mainly backwards, and but slightly downwards. Horns of 24 inches are good.

Of the mainland races of the species, which are all larger than the Cyprian, the one making the nearest approach to the latter appears to be that of the Cilician Taurus, at the extreme southern base of the peninsula of Asia Minor, and thus nearest to Cyprus. Judging by the heads of three rams shot in this range by Mr. Haig Thomas in 1909, these sheep resemble the Cyprian race in the large extent and purity of the white area on the muzzle, chin, and throat of the summer coat.

In the Armenian race, *O. orientalis gmelini*, which stands as much as 33 inches and may have horns exceeding 40 inches in length, the direction of

the horns is almost immediately backwards,[1] and the outer front angle is distinct. The general colour of the upper-parts apparently is russet-yellow or foxy red, with a dark purplish brown mark above the knees and a darkish streak on the chest ; the spinal region being darker than elsewhere. In the winter coat there is a light saddle-patch, and the throat has a short ruff, which is almost entirely chestnut and black in colour, and thus quite different from that of the urial. Although there is less white on the chin and throat, the white areas and the dark flank-band are probably much the same as in the Cyprian race.

Of the Anatolian race (*O. orientalis anatolica*) little is known in this country, and, owing to its being in Russian, I am unfortunately unable to avail myself of the information conveyed in Dr. Nasonov's memoir. The skull represented in figs. 2 and 3 of that memoir shows, however, that the horns are much curved downwards.

In 1900 Dr. A. Günther[2] described, under the name of *O. ophion urmiana*, the frontlet and horns of a sheep from one of the small islands (Koyun Daghi) in Lake Urmi, Western Persia. In associating this sheep with the Cyprian, rather than with the mainland forms of the red sheep, its describer relied largely upon the rounding-off of the outer front angle of the horns. On the other hand, a

[1] See Nasonov, *op. cit.*, p. 1276, fig. 1.

[2] *Journ. Linn. Soc. London,—Zool.*, vol. xxvii. p. 374, 1900.

quite different view is taken by Dr. Nasonov,[1] who regards the Urmian sheep as a distinct species (*O. urmiana*), with the Elburz and Ispahan representatives of the red sheep as local races. The characters on which Dr. Nasonov relies are not, however, of specific value, and all these sheep may therefore be regarded as local forms of *O. orientalis*. As regards the Urmian red sheep (*O. orientalis urmiana*) all that can be stated here—in the absence of specimens in this country for comparison—is that the horns, according to the figure given by Dr. Nasonov,[2] are bent sharply downwards, with very little backward inclination, so that their tips project far below the plane of the upper cheek-teeth, instead of being practically continuous with the same. Probably there is a well-developed throat-ruff in the winter coat, like that of the next race.

In the year 1876 Dr. W. T. Blanford[3] pointed out that the wild sheep inhabiting the southern flank of the Elburz Mountains, to the north of Tehran, was *O. orientalis* (or, as he called it, *O. gmelini*). This was confirmed by a series of heads obtained about 1904 at an elevation of some 10,000 ft. in that range, one of which is now in the British Museum (Natural History), by the Hon. W. Erskine. To this sheep I gave the name *O. gmelini erskinei*,[4] a

[1] *Op. cit.*, p. 1081.
[2] *Op. cit.*, p. 1283, fig. 4.
[3] *Eastern Persia*, vol. ii. p. 87, London, 1876.
[4] *The Field*, vol. civ. p. 1031, 1904.

FIG. 1

FIG. 2

FIG. 1. Skull and Horns of Baluchi Urial from Waziristan.
FIG. 2. Skull and Horns of Kopet Dagh Urial.

designation subsequently amended to *O. orientalis erskinei.* In referring the Elburz sheep to *O. orientalis* rather than to *O. vignei*, I was guided by the backward sweep of the horns, the flatness of their inner surfaces, the partial rounding off of the front outer angle, and the relatively small development and dark colour of the throat-ruff. The colour of the coat, judging from the head, is much less red than in the Cyprian and Armenian races, and the bevelling of the front outer angles of the horns much less marked than in the former. In consequence of this the horns of the South Elburz red sheep have a flatter front surface, more or less distinctly defined from both lateral surfaces, instead of merging into the outer one.

Special interest attaches to this approximation to the urial, as the habitat of the present race impinges on that of the latter, which includes the northern flank of the Elburz, and likewise the Kopet Dagh, dividing Persia from Turkestan. A further approximation of the urial to the red sheep is exemplified by the fact that the "perversion" in the direction of the horns normally characteristic of the latter occasionally makes its appearance in the former. Whether another resemblance to the urial is presented by the disappearance of the dark flank-band of the typical race, I am not aware.

Another race of the red sheep, from the Ispahan district of Persia, was described by Dr. Nasonov in

1910 as *Ovis orientalis isphahanica*, but was subsequently renamed *O. urmiana isphahanica*.[1] As the description is in Russian, I am unable to give the characteristics of this race.

In this place reference may be made to a sheep from the Laristan district of South-eastern Persia for which Dr. Nasonov proposed the name *Ovis laristanica* in 1909, following this with an illustrated description in his memoir of 1911.[2] Of this description I am enabled, through Dr. Nasonov's courtesy, to give a free translation.

In the winter coat the crown of the head, forehead, and muzzle are blackish; a black streak runs from the eye to the mouth, below which is a narrower one of grey; the occiput is brownish yellow, and the outer side of the ears is dark grey. A strong black ruff, with an admixture of brownish yellow hairs in the middle, decorates the throat; and there is also long blackish hair on the neck, extending on to the chest. The general colour of the upper side of the body is dark brownish yellow; but a dark band extends across the shoulders, behind, and parallel with this is a white band, and in front a white patch, with mingled brownish hairs, extending to the neck, thus forming a kind of double saddle-patch. The dark of the upper-parts is separated from the white of the belly by a blackish flank-band; the front and outer side of the

[1] Nasonov, *op. cit.*, p. 1290. [2] *Op. cit.*, p. 1295.

fore-legs above the knees is tawny black, with a streak of the same extending part way down the front below the white knee. Elsewhere the lower portion of the fore-legs is white, as is the same part in the hind-limbs; the upper portion of the latter being coloured like the back, but gradually darkening towards the hock. The tail is whitish.

The summer coat is very different, the general colour of the upper-parts being chestnut, with, in place of the divided saddle-patch, a chevron of whitish spots with a dark band in front; while the black flank-stripe is reduced to a patch behind the shoulder. The face is greyish yellow, with large dark spots on the muzzle, and the same black stripe connecting the eye with the angle of the mouth. The neck-mane and throat-ruff are practically absent.

The general character of the horns is much the same as in the more typical races of the urial, from all of which the Laristan sheep is distinguished by the dark colour of the winter coat and the divided saddle-patch.

The locally variable wild sheep known in the Salt Range of the Punjab as the urial, in Astor as the urin, in Ladak as the sha or shapo, and arkal in the Ust-Urt plateau, to the west of Lake Aral, forms a species, *Ovis vignei*, distinguished from the red sheep by the horns normally being directed forwards by the sides of the face, so that the right

one forms a regular right-handed spiral. Both the front angles of the horns are also strongly developed, so that the front surface is flattened, or even concave. The ewes likewise carry small, upright horns. Speaking generally, it may be said that the urial is a less brightly coloured animal than the red sheep, with an abundant throat-ruff, largely composed in most cases of white hairs in the winter coat of old rams, but often no distinct dark flank-band dividing the fawn of the back and flanks from the white of the under-parts, and no conspicuous white saddle-patch in the same dress.

The colour of the urial as a whole, that is to say inclusive of all the local races then known, was described by Dr. W. T. Blanford[1] as follows :—

"Above in summer rufous grey or fawn, in winter light greyish brown; lower-parts, limbs, buttocks, and tail whitish or white; ruff sometimes black throughout, but generally with some white hairs and in old rams white in front, gradually passing into black behind. Muzzle in old animals whitish or white. A patch behind the shoulder black or blackish, sometimes a blackish lateral line and markings outside the limbs. Females and young males are almost uniform greyish brown, paler beneath.

"Height of a male 32 inches, length 48, tail 4. Some Ladak specimens are larger and are said to be 3 feet or more in height."

[1] *Fauna of British India—Mammalia*, p. 498.

The same writer observes that the horns arise close together on the forehead, diverge considerably, and are curved round nearly in a circle, sometimes keeping almost, or even absolutely, in one plane, but sometimes spirally wound. The curve very rarely exceeds a circle. Lengths of from 24 to 30 inches, with a girth of about 10 inches, are good dimensions for horns of Punjab and Ladak specimens; but, as recorded below, these measurements are greatly exceeded by some heads from other localities.

The range of the urial is very wide, extending from the Turkoman country along the north side of the Elburz range of Persia to Baluchistan, Afghanistan, the Trans-Indus and Punjab Salt Ranges of India, Astor, Gilgit, Ladak, and eastwards into Tibet. Not less remarkable is the variation in its vertical range, which extends from a height of between 14,000 and 12,000 feet in Ladak and Tibet to a few hundred feet above sea-level in the Punjab and Sind. This implies, of course, corresponding differences in climate; the Trans-Indus Ranges and the Salt Range being some of the hottest parts of India in summer, whereas the winter climate of Astor and Ladak is intensely cold.

With such a great geographical range, it is but natural to expect that the urial would exhibit considerable local variations, and the following

races or sub-species have been already recognised :—

The typical urin (*Ovis vignei*) of Astor, from which the shapo of Ladak appears inseparable, is a comparatively large sheep in which the coat is fawn-coloured rather than foxy rufous. As a rule, the horns of old rams turn markedly inwards at their tips, and have their front angles moderately prominent. The Gilgit urial is perhaps referable to this race.

In the Baluchi urial (*O. vignei blanfordi*) the horns tend to turn outwards at the tips, forming a more open spiral, and have the front angles prominent and occasionally showing a beaded structure (pl. xx. fig. 1). This race was described by Mr. A. O. Hume in 1877 from the skull of a ram from the Kelat district of Baluchistan, in which the tips of the horns curve outwards, so as to form a spiral, so open that a portion of the inner surface (which in other urial is completely concealed) is visible in a front view. In a second skull from Kelat (in the British Museum) the spiral is, however, much less open, and there is no marked outward divergence of the tips, but it must belong to the same race; and the presumption is that the urial from the rest of Baluchistan, Afghanistan, and the Trans-Indus districts in general, likewise belong to *O. v. blanfordi*, as the Indus forms an impassable barrier to these sheep. The finest known horns of this race

are those of the head represented in pl. xx. fig. 1, which is from a ram shot by Major G. Dodd in Waziristan. The horns measure 41½ inches along the curve, and display very distinctly the beaded character of the front outer angle so frequently seen in the horns of this race.

The true urial (*O. v. cycloceros*) of the Salt Range and other hills of the Cis-Indus districts of the Punjab appears to be a smaller and redder animal than either of the preceding, with the horns forming a very close spiral, and showing no tendency to turn out at the tips, while their front angles are not prominent, and the anterior one is often more or less rounded off. The record horn-length for this race appears to be 39 inches.

The arkal sheep of the Ust-Urt Plateau of the Turkoman country, lying to the west of Lake Aral, was described as a distinct species, under the name of *Ovis arkal*, but as it can scarcely be regarded as anything more than a local race of the urial, it is better known as *O. vignei arkal*. The sheep inhabiting the northern flank of the Elburz Range of Persia and the Kopet Dagh, which divides Persia from Turkestan, do not appear even racially distinct from the arkal, although it has been proposed to regard them as representing a distinct race, under the name of *O. v. varentzowi*.[1] The arkal is specially characterised by the breadth

[1] Satunin, *Mitteil. Kaukas. Mus.*, vol. ii. p. 175, 1906.

and flatness of the front surface of the horns (pl. xx. fig. 2), which has very sharp lateral angles, and frequently carries very few transverse wrinkles. In old rams, however, this flatness seems to be less marked. These urial run very large, and the old rams in winter carry long and unusually white

Skull and Horns of Kopet Dagh Urial.

throat-ruffs ; both these features tending to connect them with the smaller races of the argali, from which they are not far removed in space. Fine specimens of the horns of the North Elburz arkal attain a length of from 45 to 47 inches. A good account of the Elburz urial will be found in Major R. L. Kennion's *By Mountain, Lake, and Plain*.[1]

[1] Page 278, Edinburgh and London, 1911.

The following account of the habits of urial is given by Dr. Blanford:[1]—

"In Ladak this sheep inhabits open valleys; in Astor and Gilgit it keeps to grassy ground at moderate elevations below the forest; in the Salt Range of the Punjab, and in Sind, Baluchistan, and Persia, it is found on undulating or hilly ground cut up by ravines, and is more often seen on stony and rocky hill-sides than amongst bushes and scrub. The herds vary usually from three or four to twenty or thirty in number; the sexes are generally together, but the males often keep apart in summer. These sheep are wary and active; although not such masters of the art of climbing amongst precipices as the goats, tahr, or bharal, they get over steep places with wonderful ease. Their alarm-cry is a shrill whistle, their usual call a kind of bleat.

"The rutting-season in the Punjab is September. According to Adams the period of gestation is seven months, but according to Sclater, from observations in the Zoological Gardens in London, only four. It is not improbable that the true period is between the two. The young in Astor are produced about the beginning of June, and the rutting-season there must be considerably later than September. One or two young are born. This species has bred freely with tame sheep."

The last statement is of importance in connec-

[1] *Op. cit.*, p. 499.

tion with Dr. Duerst's view that the Kopet Dagh urial is the ancestor of the turbary sheep of the Prehistoric Swiss lake-dwellers, and that the Ladak and Tibetan urial is probably the progenitor of the domesticated sheep of those countries.

The largest and finest of all the wild sheep is the argali (*Ovis ammon*) of Central Asia, typified by the race inhabiting the Altai, but including a number of more or less nearly allied races, such as the magnificent Marco Polo's sheep of the Pamirs, most of which were at one time classed as distinct species. They show, however, such marked signs of more or less complete intergradation, that it is far preferable to regard them as local modifications of a single widely spread and variable species, although this renders its definition a matter of some difficulty. Indeed, the limitations of some of the local races are at present by no means properly defined.

Although its Bokharan representative is smaller, and thus tends to connect the other races with the Kopet Dagh urial, the argali is by far the largest of the Asiatic wild sheep, or, indeed, of all wild sheep, standing in some cases close on 4 feet at the withers. It is also a paler sheep than the urial, often showing a large amount of white on the hind-quarters, which may extend in summer over the greater part of the thighs, and having more or less white on the muzzle, while in winter old

rams of several of the races develop a voluminous white ruff on the throat, which may disappear in the summer coat. There is no dark flank-band separating the fawn of the upper-parts from the white of the belly, although there may be a blackish patch behind the upper part of the fore-leg. The summer coat, which is quite short, is always much lighter than the thick winter one. In old rams the horns are very large and massive, but display considerable racial variation in thickness and direction; the thickest and least expanded horns occurring in the typical Altai argali and its immediate relatives, and the thinnest and most outwardly directed in Marco Polo's argali. In all cases the transverse wrinkles of the horns are strongly developed, but there is considerable racial variation in regard to the prominence of the outer front angle, which in the Altai type is more or less completely rounded off.

The range of the species extends from Bokhara in the west to Mongolia and Kamchatka in the east.

The various local races may be classified according to the thickness and direction of the horns.

Commencing with the races in which the horns are of the thickest and most massive type, the first on the list will be the Tibetan argali (*O. ammon hodgsoni*), inhabiting the plateau of Tibet, from northern Ladak to the districts north of Sikhim,

and northwards to the Kuenlun Range; its eastern limits are not definitely known. The thick, massive horns of old rams form, at most, but very little more than one complete circle, and when this is the case their tips do not extend beyond the lateral margins of the middle portion of the horns, or, at most, to a very small degree. The maximum length is from about 48½ to 57 inches, and the basal girth from 17 to 19 inches. Old males develop an abundant throat-ruff of long white hairs, which appears to be retained at all seasons,[1] and it is probable that the summer coat is not so short as that of the Altai argali, as the present species lives at a much greater elevation, which in summer is over 15,000 feet above sea-level, although in winter 12,000 feet forms the lower limit.

Dr. Blanford[2] described the colour of the (apparently summer) coat of the Tibetan argali as being "greyish brown above, paler and whitish below. In males the caudal disk surrounding the tail, the rump, throat, chest, belly, and insides of the legs are white, chest and a stripe down the front of each leg dark. Old males are grizzled on the back, white hairs being mixed with the brown of the upper-parts. A dark mark above the tail. Females have little or no mane, the white is less pure, and the caudal disk is indistinct."

[1] Blanford, *Proc. Zool. Soc. London*, 1896, p. 787.
[2] *Fauna Brit. India—Mamm.*, p. 495.

FIG. 1

FIG. 2

FIG. 1. Head of Mongolian Argali.
FIG. 2. Head of Siberian Argali.

It is added that the height of old rams at the shoulder is $3\frac{1}{2}$ to 4 feet, that of females not much less. Length from nose to rump (skins), males 6 to $6\frac{1}{2}$ feet, females $5\frac{1}{2}$; tail without hair 1 inch, with hair 3; ear 6; basal length of male skull 13, breadth at orbits $7\frac{1}{2}$. The largest recorded horns of this race measure 57 inches in length and $18\frac{3}{4}$ in girth, with a tip-to-tip interval of 29 inches.

As regards habits, Dr. Blanford observes that "this magnificent sheep inhabits the bare undulating Tibetan plateau in herds, keeping to open valleys and low stony slopes. In summer the rams are found in small parties of from three or four to about fifteen, apart from the ewes. The rutting-season is in winter; at this time the great sheep inhabit the lower and more sheltered Tibetan valleys. The young are born about May or June."

The so-called *Ovis brookei* appears to be a hybrid of this race, the result of a male argali having wandered into Zanskar, where it consorted with a herd of urial.[1] A presumed hybrid between a male urial and a female Tibetan argali has likewise been recorded.[2]

The argali of northern Mongolia (*O. ammon jubata*) appears to be in some degree intermediate between the Tibetan and Siberian races, having, at

[1] See Sterndale, *Proc. Zool. Soc. London*, 1896, p. 205.
[2] Blanford, *ibid.*, 1885, p. 851.

least in winter, the white throat-ruff of the former, but the tips of the horns of old rams turning upwards somewhat in the fashion of those of the latter. The horns of an old ram belonging to Mr. Haig Thomas, which came under my notice a few years ago, closely resembled those of the type specimen described and figured by Professor Peters, who first named this race, and differ from those of the Siberian argali by the absence of that marked "nipping-in" of the descending portion below the eyes, and thereby approximate to those of the Tibetan argali. When viewed directly from the front, there is, however, a distinct angulation at the upper end of the space between the horn and the skull, although this is less marked than in the Siberian argali; in the Tibetan race it is practically absent. The right horn measured 41½ inches in length and 17½ inches in girth.

In the head shown in plate xxi. fig. 1, the above features are not very apparent, owing to its being viewed somewhat obliquely, instead of full face.

The typical representative of the species is the true *Ovis ammon* of the Altai, in which, when fully developed, the horns of old rams (pl. xxi. fig. 2) form more than one complete circle, so that their tips extend much beyond the lateral margins, while they are rounded in front, and closely approximated to the sides of the face, so that when viewed directly from in front the space between each horn and the

head is sharply angulated above. The maximum length of the horns ranges from about 59 to 62 inches, with a girth of from 18 to 20 inches. There is a more or less distinct white patch on the rump, not extending on to the thigh, which is dark like the back ; and there is no throat-ruff, even in winter.[1] In the short summer coat the colour is very light, somewhat like that of whitey-brown paper. The height at the shoulder ranges from about 45 to 48 inches ; this race being apparently the biggest of all. As in the Tibetan argali, there is considerable individual variation in the horns, some having the outer front angle much more prominent than others.

The range of the typical argali apparently once extended from the mountains bordering Lake Baikal to the Altai, but at the present day is chiefly restricted to the Semipalatinsk division of the latter.

A favourite shooting-ground is the district lying east of Semipalatinsk, approximately in longitude 50° N. by latitude 88° E. Here the wild sheep inhabit undulating plateaus at an elevation of from 6000 to 10,000 feet above sea-level.[2]

In the year 1904 Dr. J. A. Allen,[3] of the American Museum of Natural History, described

[1] Blanford, *Proc. Zool. Soc. London*, 1896, p. 787.
[2] *Ibid.*, p. 788.
[3] *Bull. Amer. Mus. Nat. Hist.*, vol. xx. p. 293, 1904.

the skull of a wild sheep obtained to the east of Fort Tigil, on the western side of Kamchatka, as a new species, under the name of *Ovis storcki*. He refers to it as having horns of the *ammon* type, but of much smaller size than those of any member of the group then known to him, and describes it as follows :—

"Horns a close spiral, forming a circle and a half, curving at first outward and downward, and finally upward again. The frontal surface is finely ribbed transversely to the axis of curvature, with a sharp angle at both edges, continued nearly to the tip ; the exterior ('orbital') and interior ('nuchal') surfaces meet so as to form a broadly rounded 'nuchal edge,' very broad basally, but becoming thinner and sharper apically. The spiral is very close ; at the end of the first circle the horns approach the face just in front of the orbits, so nearly as to be distant from the facial portion of the skull by only a space equal to the anteorbital breadth of the skull [this being what I call the 'nipping-in' of the typical *ammon*], and then sweep abruptly outward. The form of the spiral is thus similar to that seen in *O. ammon*."

The horns measure 40 inches in length, with a basal girth of $11\frac{1}{2}$, and a tip-to-tip interval of $23\frac{3}{4}$ inches.

Following the classification adopted here, this sheep must be ranked as a small race of the argali,

under the name of *O. ammon storcki.* In its small size it is analogous to the Bokharan argali, the most western representative of the species; this diminution in corporeal bulk at the two extremities of the range of the species being a feature which might naturally be expected to occur.

The next representative of the species is the Saiar argali (*O. a. sairensis*), from the Saiar or Jair Mountains of Zungaria, which has small but relatively massive horns, usually measuring about 45½ to 47 inches in length, with a girth of from 14½ to 15½ inches. This sheep serves in some degree to connect the typical Altai argali with the Pamir race of the species, the horns being more open than in *ammon*, but less so than in any of the following races; they are also less finely wrinkled than in *ammon.* From both *ammon* and *poli* the Saiar argali differs by the upper part of the face being brown and the muzzle white.

In the year 1873 the Russian naturalist Severtzow gave the name *Ovis karelini* to a wild sheep from the Alatau Mountains of the Semirechensk Altai, immediately north of Lake Issik (Issik Kul). With this race Messrs. V. and B. Brooke[1] subsequently identified the wild sheep brought home by the Yarkand Expedition in 1873 from the western end of the Tian Shan to the north-west of Kashgar; and this identification was followed by Dr. W. T.

[1] *Proc. Zool. Soc.*, 1875, p. 512.

Blanford.[1] The western end of the Tian Shan is, however, a very long way from the Alatau; and the sheep from the former area are therefore probably distinct from those of the latter. Unfortunately the British Museum possesses no specimen of *O. ammon karelini*, as this race should be called, from the Alatau, and the only ones believed to belong to this race with which I am acquainted are two skulls, with horns, in the collection of Sir E. G. Loder, at Leonard's Lee, Horsham. In the larger of these (pl. xxii. fig. 1) the length of the horns is $49\frac{1}{2}$, the girth $16\frac{1}{4}$, and the tip-to-tip interval $25\frac{1}{2}$ inches; the corresponding dimensions of the smaller specimen being $45\frac{1}{2}$, $14\frac{3}{4}$, and 34 inches. Although the horns of these specimens are very like those of the under-mentioned Kulja argali (pl. xxii. fig. 2), they are of a rather thicker type, with a somewhat less degree of lateral expansion, and a smaller tip-to-tip interval; but if Sir E. G. Loder's specimens are the true *karelini*, they indicate the close relationship between that race and the Kulja argali.

The race of the argali inhabiting the mountains bordering the tributaries of the Ili valley on the northern flank of the western Tian Shan, some distance to the south-east of Kulja, or Ili, was described by myself,[2] on the evidence of a head

[1] *Scientific Results of Second Yarkand Expedition—Mammalia*, p. 80, Calcutta, 1878.

[2] *Proc. Zool. Soc.*, 1902, p. 80.

PLATE XXII

FIG. 1

FIG. 2

FIG. 1. Skull and Horns of Alatau Argali.
FIG. 2. Head of Kulja Argali.

presented to the British Museum by Mr. St. George Littledale, in 1902, as a local race of *sairensis*, but is now known as *O. ammon littledalei*. It is a large sheep, with relatively long, thin horns (pl. xxii. fig. 2), in which the maximum length ranges from about 55 to 58 inches, while the girth is about 17 inches or rather more, and the tip-to-tip interval from 41 to 45 inches. In the typical specimen, which is the one represented in the illustration, the horns do not come up to these dimensions, the length being 51, the girth 16¾, and the tip-to-tip interval 41 inches. This Kulja sheep has the same greyish brown forehead and white muzzle as its smaller Saiar relative, but the ears are smaller and somewhat further removed from the horns, while the latter are less "nipped in" below the eyes than in the Altai race, and show more of the inner surface when viewed directly from the front. A white ruff is developed on the throat and chest in the winter coat.

In the original description it is stated that the horns differ from those of the typical Altai argali by rising from the skull at a much greater elevation, so as to be widely separated from the rather small ears, instead of being partially overlapped by them.

The horns themselves are of a more massive and less elongated type than those of *O. ammon poli*, and are markedly distinct from those of the sheep from the western Tian Shan identified by

Dr. Blanford with *karelini*, in which the front outer angle is, at least frequently, bevelled off. On the other hand, they are less massive and considerably more open than those of the typical *O. ammon*, and therefore much more so than in the Tibetan *O. a. hodgsoni*. In *O. ammon* the surface next the face tends to look upwards, whereas in the present race its tendency is to look downwards. A more easily recognised difference is that in *O. ammon* the horns are greatly "nipped in" just below the eyes, in consequence of which the transverse diameter across the eyes is very much less than it is higher up. In the present race, on the contrary, the horns are actually wider across at the level of the eyes than they are at the line of the crown of the head.

Such a "nipping in" is not apparent in *O. a. hodgsoni*, in which the surface next the face is nearly vertical; and much the same is the case with *O. a. sairensis*. In fact the present race appears to bear somewhat the same relationship to *sairensis*, so far as the curve of the horns is concerned, as is presented by the typical *ammon* to *hodgsoni*, although the extreme openness and basal elevation of the spiral are unique. There are other differences (especially as regards the wrinkles) of the horns of the Kulja argali from those of the typical *ammon*, sufficiently apparent when the specimens are seen side by side, but almost impossible to describe.

In the paper cited above I provisionally identified with the Kulja argali the skull and horns of an argali shot by Mr. Littledale at Tarbagatai, which is considerably to the north of Kulja, in the Altai. Tarbagatai is, however, separated from the mountains north-east of Kulja by a strip of low-lying country, which forms a gap in the highlands through which such animals as the saiga antelope are able to pass. It therefore seems quite likely that the Tarbagatai argali may represent a distinct race. In the skull presented by Mr. Littledale to the British Museum the horns measure 48 inches in length, with a girth of 17 and a tip-to-tip interval of 40 inches. In another Tarbagatai specimen shot by Mr. A. B. Worthington, the length of the horns is 51 and the girth $17\frac{1}{4}$ inches. These measurements seem to indicate a rather thicker-horned sheep than the Kulja argali.

Allied to the Kulja race but of much smaller size, is an argali from the Karatau (Black Mountains) of Bokhara, to which Severtzow gave the name *O. nigrimontana*, but which may now be known as *O. ammon nigrimontana*. In a head brought home by Mr. D. Carruthers the horns measure only $35\frac{3}{4}$ inches in length, with a girth of $10\frac{1}{2}$, and a tip-to-tip interval of 24 inches. The horns of this specimen agree essentially in general characters with those of the Kulja race. The diminutive size of this, the most westerly representative of the

argalis, is, as mentioned above, paralleled by the easternmost race.

In an article published in *The Field* of October 1909, Mr. Carruthers suggested that this sheep is akin to the urial, but, as was pointed out by myself in the same journal, the points of the horns of *nigrimontana* turn outwards to a much greater extent—with a concomitant increase in the span—in a manner unknown in any race of the urial; while in none of the latter is the inferior surface of the horn visible in the descending portion of the spiral in the manner seen in *nigrimontana* and *littledalei*. Then, again, the description given by Mr. Carruthers of the colouring of the coat of his specimen appears to agree much better with that of the argali than that of the urial type; while he makes no mention of the long throat-ruff so characteristic of the latter.

Mr. Carruthers also states that the nearest neighbour of *nigrimontana* is the sheep from the Alexandrovski mountains, west of Issik Kul, described by Severtzow as *Ovis heinsi*, and this he admits to approach the one identified with *karelini*, which, like *littledalei*, is not far from *poli*. Accordingly, both on structural and distributional grounds, there seems every reason to regard *nigrimontana* as a dwarf race allied to *O. ammon littledalei*, and *O. a. poli*. This is practically the view taken by Dr. Blanford, who in his account of the mam-

mals of the Second Yarkand Expedition, wrote as follows :—

"The two species of sheep described by Severtzow from Western Turkestan, *O. heinsi*, from near Tollmak, north of Lake Issyk, and *O. nigrimontana*, from the Karatau or Black Mountains, north-east of the Syr or Jaxartes, are smaller forms, but apparently more nearly allied to *Ovis poli* and *O. karelini* than to any other species of wild sheep. It may not improbably be found that intermediate varieties occur, and that all these forms of wild sheep are merely races more or less completely differentiated."

Of the race which should be known as *O. a. heinsi* I have never seen specimens, and until such are available for comparison in London its distinctive characters must remain unknown, as the original description is insufficient.

The argali inhabiting the mountains to the north-west of Kashgar, which was identified by the Messrs. Brooke with Severtzow's *Ovis karelini*, and subsequently regarded by Dr. Blanford as a variety of *O. poli*, is not, as already mentioned, the true *karelini*, but appears to represent a race connecting *littledalei* with *poli*. The horns are lighter, with the front outer angles in some cases more rounded off and the tips more extended outwards than in *littledalei*, but are smaller than those of *poli*. So far as can be determined from the faded con-

dition of the mounted specimen in the British Museum (Nat. Hist.), the upper part of the face is brownish and the muzzle white. In this specimen, which appears to be an adult male, the horns measure 48 inches in length, with a basal girth of 15 inches, and a tip-to-tip interval of 38 inches. A skull and horns of an argali brought by Mr. D. Carruthers from the Aksai plateau of Chinese Turkestan are of the same general type as the above.

The last of the argalis is the great sheep inhabit-

Skull and Horns of the Pamir Argali, or Marco Polo's Sheep

ing the Pamirs, or "Roof of the World," which takes its name from the Venetian traveller Marco Polo, by whom it was discovered in the thirteenth century. In this race (*O. ammon poli*) the enormous horns of old rams are longer and relatively narrower than in any of the other argalis, forming much more than one complete circle, with the front surface markedly angulated, and the maximum lengths ranging from about 69 to 75 inches, the girth from 14½ to 16, or, rarely, 17 inches, and the tip-to-tip interval from 48 to 56 inches.

The following description of this sheep is taken, with one or two verbal alterations, from my *Game Animals of India, &c.*:[1]—

"The general colour, in the summer coat, of the upper-parts of old rams is light speckled brown; the greater portion or the whole of the face, as well as the throat, the chest, the under-parts, the buttocks, and the legs are white; the white also extending on to the outer surface of the thighs. A black streak runs from the nape of the neck to the withers. No distinct ruff of long hairs is developed on the throat in the summer coat; but in winter, when the whole coat is considerably longer, such a ruff—pure white in colour—makes its appearance on the throat and chest. At this season, too, the fur on the back shows a more decided rufescent tinge, especially towards the boundary dividing the dark from the light areas. In the ewes during winter the neck is brown in front, and there may be a dark line extending from the head to the root of the tail, this streak being absent in summer. The horns of the ewes appear to be more upright, deeper, and more sharply keeled in front than in the typical argali; although there may be an individual variation in this respect.

"A mounted ram in the British Museum stands 3 feet 5 inches at the shoulder; and the weight of an adult ram is estimated at 22 stone. The four

[1] London, 1907, p. 91.

finest pairs of horns on record respectively measure 75, 73, 71, and 70 inches along the front angle; their basal girths being 16, 15, 15½, and 17 inches, and the tip-to-tip intervals 54½, 48, 53¾, and 52 inches."

The home of this sheep is the high Pamir and the plateaus west and north of Eastern Turkestan extending to the Alai, and, in the direction of India, to the upper part of the Hunza and Nagar valleys, to the northward of Gilgit. Its habits appear to be practically identical with those of the other races of the species. A correspondent who was shooting a few years ago in the neighbourhood of the Tian Shan informed me that no good heads of this sheep were then obtainable on the neighbouring Pamirs, no specimen with horns exceeding 53 inches in length having been shot there since 1905. He added that out of a large number of specimens he has seen none exceeding these dimensions.

Two Spanish missionaries appear to have been the first to make known to Europeans the existence of a wild sheep in North America. According to a summary of the account of this discovery given by Dr. J. A. Allen:[1] "Father Juan Maria de Salvatierra crossed the Gulf of California from the mouth of the Yaqui River, Sonora, to California, and took formal possession of the country in the name of the

[1] "Historical and Nomenclatorial Notes on North American Sheep," *Bull. Amer. Mus. Nat. Hist.*, vol. xxxi. p. 19, 1912.

King of Spain on October 25, 1597, and was soon joined by Father Francis Maria Piccolo. . . . It was in this region that they met with the *taye*, as recorded by Piccolo,[1] the historian of these first attempts to establish missions in what is now Lower California.

Piccolo called the *taye* the Californian deer, although he also refers to it as a sheep, on account of its somewhat resembling European sheep in make.

The typical Rocky Mountain sheep, or bighorn, as it is universally called in its own country, was, however, not discovered by Europeans till a much later date. To quote again from Dr. Allen,[2] it appears that "the first specimen of this sheep known to science was killed and preserved by Duncan McGillivray, an agent of the North-west Fur Company, who accompanied the well-known explorer and surveyor, David Thompson, while making his survey of the upper Bow River country of Canada in the year 1800. McGillivray has left on record definite information as to the time and place of its capture, and a first-hand account of the habits, haunts, and external characters of this now well-known species. It appears from his narrative that these two explorers first met with these

[1] See *Phil. Trans. Roy. Soc. London*, vol. xxvi. p. 336, 1708; this being a translation of an earlier French account.

[2] *Op. cit.*, p. 2.

animals on November 30, 1800, near what is now Calgary in southern Alberta, where the Bow River emerges from the first range of the Rocky Mountains, in, as McGillivray states, longitude 115° 30′ west, and latitude 50° north. They found here a small band, and killed a number of them, including a fine old ram. McGillivray recognised the animal as a nondescript, and preserved the skin of the ram to be sent to the Royal Society of London.

In 1804 the Rocky Mountain bighorn was named *Ovis cervina* by the French naturalist Desmarest, and almost simultaneously *O. canadensis* in Shaw and Nodder's *Naturalists' Miscellany*. Consequently, naturalists have been much divided in opinion as to which of these names should be employed for the species; as there is nothing in the least deer-like about the animal, the second is, however, decidedly preferable to the first.

The bighorn (inclusive of all the wild sheep that can be included under that name) differs from all the species hitherto noticed in this chapter by the comparative smoothness of the large and massive horns of old rams, in which the transverse wrinkles are replaced almost entirely by pronounced lines of growth; the outer front angle being strongly developed, but the inner one rounded off. The face-glands are also smaller than in any of the preceding species of wild sheep. In the darker phases there is a large and conspicuous white

FIG. 1

FIG. 2

FIG. 1. Head of White Alaskan Bighorn.
FIG. 2. Head of Sonoran Bighorn.

rump-patch. The horns of ewes are small and upright.

The typical Rocky Mountain bighorn (pl. xxiv. fig. 1), which stands about 38 inches at the shoulder, has moderately long and pointed ears, with short hair, and the horns of the rams, which are very thick and heavy, form about one complete turn of a circle, diverge but little outwards, and very generally have the tips more or less broken. The body is heavy and covered with closely adpressed hair, showing no signs of a throat-ruff. The general colour is greyish brown in summer, darker on the back than elsewhere; but the under-parts, the inner sides of the limbs, the upper portion of the throat, and a patch on the rump and round the root of the tail are whitish: in winter the general colour is lighter and greyer. The maximum recorded horn-length is 44 inches, and the maximum girth something over 17 inches; but any horns of 40 inches or more in length, with a basal girth of from 15 to 17 inches, may be considered good.

The typical bighorn is a native of the higher mountain ranges from British Columbia to Arizona.

Dr. Allen and other American naturalists recognise rather more than half-a-dozen local phases or races of the American bighorn, some of which differ mainly in colour, while others display differences from the typical animal in the length of the ears and the form of the skull and horns.

The local forms of the bighorn may be arranged as follows:[1]—

Firstly, we have the aforesaid typical *Ovis canadensis*, or *O. cervina*, the *bélier de montagne* of Cuvier, from the eastern slope of the Rocky Mountains, between the Missouri and Saskatchewan Rivers, and thence to Dakota in one direction and British Columbia in the other. The horns of the rams are thick and massive, frequently broken at the tips; and the ears are of medium size and pointed, generally measuring about $4\frac{1}{2}$ inches in length. The general colour of the coarse and rough coat varies considerably according to season and to some extent individually, but, exclusive of the rump-patch and muzzle, that of the upper-parts and outer sides of the limbs may be described as uniformly greyish brown; the front surfaces of the hind-legs being considerably darker—Vandyke brown, and the chest and under-parts are likewise darker. The large rump-patch is whitish or creamy yellow.

The Californian bighorn (*O. c. californica*), described by Douglas so long ago as 1829, and typically from the neighbourhood of Mount Adams, Yakima County, Washington, whence it formerly ranged through the Cascade Mountains to Mount Shasta

[1] See W. T. Hornaday, "Notes on the Mountain Sheep of North America," *Rep. New York Zool. Soc.*, 1901, pp. 77-122, and J. A. Allen, "Historical and Nomenclatorial Notes on North American Sheep," *Bull. Amer. Mus. Nat. Hist.*, vol. xxxi., pp. 1-29, 1912.

and the adjacent chain of northern California, appears to have been so similar to the typical bighorn that its right to distinction seems very doubtful.

Much the same thing may be said with regard to *O. c. auduboni*, described by Dr. Merriam[1] in 1901 on the evidence of skulls from the Bad Lands of South Dakota. These are stated to be distinguished by their large size, and the great proportionate length of the row of cheek-teeth. Certain structural differences in the skull are also mentioned; and the horns are stated to be larger and narrower than in the typical *canadensis*.

The fourth race, *O. c. mexicana*,[2] from the neighbourhood of Lake Santa Maria, Chihuahua, Mexico, and thence to western Texas, southern New Mexico, and the south of Arizona, is a large sheep, lighter in colour than the Rocky Mountain bighorn, but with the same arrangement of tints, much larger ears, a slightly longer tail, and relatively large cheek-teeth. The general colour is described as drab-brown, with no dorsal stripe, the rump-patch broad; the throat, legs, and tail darker than the back; and the chin and inner and hind surfaces of the hind-legs whitish. The colour is said to be intermediate between that of the typical *canadensis* and the under-mentioned *nelsoni;* the massive skull has the frontal region less concave than in

[1] *Proc. Biol. Soc. Washington*, vol. xiv. p. 31.

[2] Merriam, *op. cit.*, p. 36.

the former, while the horns are larger and less massive.

The fifth race, *O. c. nelsoni*, described by Dr. Merriam[1] in 1907, is typically from the Grapevine Mountains, on the boundary between southern Nevada and California; its whole range extending from the mountains of southern Nevada to southern California and the northern border of Lower California. In the original description it is stated to be apparently very similar in the arrangement of the colouring to the under-mentioned *stonei*, but much paler, with the rump-patch small and completely divided by a dark stripe in the middle line, the tail short and slender, and the cheek-teeth relatively small.

The general colour of the upper-parts, exclusive of the rump-patch, is pale dingy brown; the under-parts and legs being much darker, and contrasting sharply with the white areas.

The bighorn of the Sierra Nevada was named *O. c. sierræ* by Mr. J. Grinnell[2] in 1912, and is stated to resemble *O. c. nelsoni* in general characters, but to be of larger size, with shorter ears and tail, a thicker and greyer coat, and the section of the horns less distinctly triangular. The coldness of its habitat accounts, of course, for the greater

[1] *Proc. Biol. Soc. Washington*, vol. xi. p. 217.

[2] *Zoological Publications of California University*, vol. x. p. 144, 1912.

density of its coat. The range of this race apparently includes part of the area assigned by Dr. Allen to *O. c. californiæ*, the validity of the latter being doubted by Mr. Grinnell.

In 1907 Dr. Mearns[1] proposed the name of *O canadensis gaillardi* for the bighorn inhabiting the Gila Mountains, between Tinajas Altas and the Mexican boundary line in Yuma County, Arizona; the whole range of this race including the mountains of north-western Sonora and south-western Arizona. Bighorns obtained by Messrs. I. N. and John Dracopoli, in the Pinacate Mountains of north-western Sonora, the head of one of which is shown in pl. xxiii. fig. 2, are accordingly referable to this race. Judging from these specimens, the Sonoran sheep appears to come very close to *mexicana*. The ears, for instance, are much longer than in the typical *canadensis* ($6\frac{1}{2}$ inches); the horns are lighter, less curved outwards, and smoother, with a less pronounced front outer angle; the sockets of the eyes much less prominent; the frontal region between them less concave; the nasal bones flatter; and the row of cheek-teeth longer, that of the upper jaw measuring $3\frac{5}{8}$ inches against $3\frac{1}{8}$ inches in a larger skull of the typical *canadensis*. The best horns obtained by Messrs. Dracopoli measured 37 inches in length and $14\frac{3}{4}$ in basal girth, with a tip-to-tip interval of 20 inches.

[1] *Mamm. U.S. and Mexican Boundary Survey*, vol. i. p. 240.

The type specimen of the Gila bighorn was a ewe, which is stated to differ from *mexicana* and *nelsoni* by its inferior size and relatively smaller feet. From Texan specimens of the former in winter coat it is said to be distinguished by the absence of white on the muzzle, so that the entire head is uniformly coloured. The narrow dark spinal stripe usually present in *nelsoni* is lacking.

The last of the more typical races of the bighorn is *O. c. cremnobates*,[1] from Mattomi, San Pedro Martir Mountains, Lower California, but probably also occurring in the neighbouring Laguna Mountains. It is described as resembling *O. c. nelsoni*, but much lighter in colour—the head being in some cases nearly white—with the rump-patch small and not divided by any perceptible line from the dark area; the front of the legs is nearly black, as in *stonei*; and the skull is unusually wide between the eye-sockets. Dr. Elliot states that the colour of the upper-parts varies from drab-grey or pale broccoli-brown to hair-brown or whitey-brown; but in some cases this sheep appears almost white. Compared with *mexicana*, its general colour may be described as whitey-brown instead of drab-brown.

It will not fail to be noticed from the foregoing descriptions that some of the more southern races differ from the Rocky Mountain bighorn by the greater length of the ears; on the other hand, the

[1] D. G. Elliot, *Pub. Field Columbian Mus.*, vol. iii. p. 239, 1903.

PLATE XXIV

FIG. 1

FIG. 2

FIG. 1. Rocky Mountain Bighorn.
FIG. 2. Clifton's Bighorn.

northern races mentioned below have the ears smaller and more blunted than in the typical bighorn, and as the same feature is found in the Asiatic members of the group, it is evident that an increase in ear-length has been gradually developed as these sheep passed from high to low latitudes. This increase in size is, however, not solely dependent upon latitude, for it is a notable fact that the races with the longest ears are inhabitants of desert districts, like Sonora; and as a number of other desert-dwelling animals are characterised by their unusually large ears, it seems evident that the reception of sound is more difficult in deserts than in other parts of the world.

By common consent all the foregoing are rightly regarded as nothing more than local phases of the true bighorn. The remaining members of the group are distinguished by their smaller size and lighter, more divergent, and sharply pointed horns of the rams (pl. xxiii. fig. 1), as well as by a tendency in the ears to become shorter, blunter, and more thickly haired. American naturalists regard all these as specifically distinct from the typical bighorn; but the difference, although much greater than between any two of the foregoing, is only one of degree, and they are accordingly all classed here as races of *O. canadensis*, or *O. cervina*, if that name be preferred.

The special point of interest connected with

these slender-horned bighorns is that they are essentially a northern type—occurring in America, in British Columbia, and Alaska—which is common to north-eastern Asia and America. This indicates that the bighorns, like most other wild sheep, had their origin in Asia, whence—alone among their kindred—they effected an entrance into the Western Hemisphere by way of what is now Bering Strait. The Alaskan and British Columbian races have retained many of the characteristics of their Asiatic forbears, whereas when they wandered far south they became differentiated into the heavy-horned type represented by the Rocky Mountain bighorn and its immediate local phases.

At one time American naturalists recognised three distinct American species of thin-horned bighorns, but these are now known to intergrade,[1] and they are consequently classed as local phases of one and the same species, whether we regard it as identical with or distinct from *O. canadensis.*

Of these American races, *O. c. dalli*, described in 1884, from the Upper Yukon district of Alaska, is, except for accidental staining, pure white at all times of the year. Near Dawson City occurs an unstable grey phase, *O. c. fannini*, connecting the white bighorn with the black bighorn (*O. c. stonei*)

[1] See Charles Sheldon, *The Wilderness of the Upper Yukon*, New York, 1911.

of the Chioni Mountains in the Stikine district of northern British Columbia, in which the colour of the upper-parts is blackish brown, while the white of the lower surface is very pure and sharply defined.

Some years ago Mr. W. H. Osgood[1] wrote to the following effect in regard to the gradation from the white to the black bighorn :—

"In the Alaskan Range and the mountains of the Kenai Peninsula the bighorns are practically white throughout, although some show a tinge of brown on the tail. Somewhat further south and east, however, the tail becomes distinctly brownish, while the back and sides show a sprinkling of dusky hairs, forming an indistinct dark mantle, although in general character these sheep are essentially white, some being indistinguishable from those of the Kenai Peninsula. In specimens from Coal Creek the dusky area is somewhat increased, and pure white individuals are fewer, the tail being blackish brown, and the dark tint often extending forward a short distance along the middle line of the back, while in certain individuals the dark hairs form a more or less definite stripe down the front of the fore-legs. Still, the general effect, particularly at a distance of a few yards, is that of a white animal, although the blackish tail is often noticeable, even in the case of a flock in the field. Next

[1] *North American Fauna*, No. 39, Washington.

come certain specimens killed near the head of the Klondyke River, some of which have a decided grey mantle and dark stripes down the legs, like *fannini*, although the head and neck are pure white. Somewhat further south, in the Stewart River district, the bighorns seem to be rather darker on the average, being, except for the white head and neck, almost like the typical *stonei*. On the Upper Macmillan River the sheep are in general of this dark type, although a few are scarcely distinguishable from typical *dalli*. From the white-headed dark sheep there is but a step to the typical black *stonei*, the change from the white to the black type being thus practically complete, and corresponding to the changes in environment."

According to Mr. Sheldon, who wrote several years later, in Alaska, from the Arctic coast south to latitude 60°, and in Yukon Territory and north-eastward in the Mackenzie Mountains to about latitude 62°, the sheep are mostly pure white, except in the Tanana Hills south of the Yukon River, where the white is varied with a few black hairs and slight indications of the colour-pattern of the *fannini* type; in British Columbia south of the Stikine River the sheep are uniformly black; but over an intervening region of from approximately six hundred and fifty miles north and about one hundred and fifty to two hundred miles east and

west, "there is no area in which the colour of the sheep is uniform."

Commenting upon this, Dr. Allen[1] observes that "the facts of intergradation are thus forcibly and clearly presented—an intergradation continuous and gradual from one extreme phase to the other through a vast expanse of country. The cause of this extensive and gradual merging of these two widely diverse colour-types of sheep is not so easily demonstrable. Has it resulted from interbreeding or is it due to environment? Mr. Sheldon favours the former hypothesis, but admits the possibility of its having been 'produced by subtle and indeterminate changes of environment to a much greater extent than the facts seem to me to warrant.'"

In an article by Mr. George Shiras in *The National Geographic Magazine* for May 1912 on the game animals of the Kenai Peninsula, Alaska, the remarkable fact is recorded that the white sheep invariably slakes its thirst by eating snow, and when feeding in a well-watered pasture, always resorts to a snow-patch for moisture.

On the Asiatic side of Bering Strait the bighorn is represented in Kamchatka by a race (*O. c. nivicola*) nearly related to the thin-horned American types, but with still shorter, blunter, and more thickly haired ears, a shorter face, a longer coat, and a comparatively small white rump-patch; its

[1] *Science*, New York, ser. 2, vol. xxxv. p. 105, 1912.

general colour being slaty grey. Further remarks on the colouring of this Kamchatkan bighorn are recorded below. The largest pair of horns known measure 39¼ inches in length, with a basal girth of 14½ inches, and a tip-to-tip interval of 28¼ inches. White bighorns have been stated to occur in Kamchatka, but apparently on erroneous evidence.

Till the year 1902, when I had the opportunity of describing[1] a specimen brought home by Mr. Talbot Clifton from the north-western end of the Verkhoyansk Mountains, forming the watershed between the valleys of the Yana and Lena, in Northern Siberia, little or nothing was known in England of the second Asiatic representative of the bighorn.

In the article to which reference has just been made, it is pointed out that Clifton's bighorn, as the Yana race has been called, appears to have been first described by Severtzow[2] in 1873, under the name of *Ovis borealis*. His description, which is brief and by no means satisfactory, is in Russian, but a translation in German was given by Professor Peters[3] in 1876. The description is as follows:— "The specimens of this sheep, which were given by Mr. Schmidt to the Museum of the Academy of Sciences at Moscow, were obtained from the mountains and highlands of the Pjasina [Piasina] and

[1] *Proc. Zool. Soc.*, 1902, p. 83.
[2] *Trans. Soc. Moscow*, vol. viii. art. 2, p. 153, 1873.
[3] *Monatsber. Ak. Berlin*, 1876, p. 180.

Chatanga districts of Northern Siberia. They seem to me to indicate a form intermediate between *O. nivicola* and *O. argali*, but nearer to the former, from which they are doubtfully specifically distinct, and with which they may be identical. From *O. argali* they differ by their smaller horns, inferior size, and whitish belly."

It was subsequently stated that the locality of the type specimens is the mountains separating the valleys of the Nyjnaya and Tunguska from those of the Pjasina and Chatanga; the Tunguska being a tributary of the Yenesei, but the Pjasina discharging into the Arctic Ocean somewhat east of the Yenesei in about long. 185° east. The travellers Dr. A. Bunge and Baron E. Toll[1] rightly identified Severtzow's *O. borealis*, which is considered inseparable from *O. canadensis*, as a sheep found in the Verkhoyansk Mountains, and thence down the valley of the Lena to its mouth.

Compared with the Kamchatkan race, Clifton's bighorn, *O. c. borealis* (pl. xxiv. fig. 2), is essentially the same type of animal, although its general coloration is lighter, there is a greater proportion of white, and the dorsal streak and tail are darker. The Kamchatkan bighorn may be roughly described as a nearly uniform grey-fawn animal, with a comparatively small white rump-patch, a certain amount of white on the muzzle, postero-internal sides of limbs,

[1] See *Beiträge Kennt. Russ. Reichs*, ser. 3, vol. iii. p. 102, 1887.

and under-parts, and a short and broad brown tail. In the male of the Yana bighorn the white rump-patch is larger, although it does not include the short and bushy tail, or extend on the buttocks above its line of origin. The face is white, with the exception of a wood-brown transverse band midway between the nostrils and the eyes, which expands to include each cheek; and the whole nape is white mingled with grey. A faint dark line runs down the back, but becomes more distinct as it approaches the tail, which is blackish brown; and there is also a larger proportion of white on the legs and under-parts. An important difference from the Kamchatkan bighorn is to be found in the larger ears, which are very thickly haired.

The head of a ewe was wholly greyish white, passing into pure white on the forehead and muzzle.

It may be added that Professor P. Matschie,[1] who regards Clifton's bighorn as typically from the Byrranga Mountains, south of the Taimyr Peninsula, between the mouths of the Yenisei and the Lena, has given the name *Ovis alleni* to the wild sheep of the Taigonose Peninsula—as represented by a head figured by Dr. Allen—on the presumption that it may prove distinct from *borealis*.

[1] In Paul Niedieck's *Kreuzfahrten im Beringmeer*, Berlin, 1907, p. 236; English translation, London, 1909, p. 226.

CHAPTER XIV

ABERRANT WILD SHEEP

Two species of wild sheep, the arui, udad, or Barbary sheep of the mountains of northern Africa, and the bharal or blue sheep of the inner Himalaya and Tibet, differ so remarkably from all their kindred, as they likewise do from one another, that they are respectively referred by many naturalists to genera by themselves, although by others they have been included in the typical genus *Ovis*. As a middle course, they have been regarded as representing two separate subgeneric groups of that extensive genus. In the features in which they differ from the more typical sheep both the arui and the bharal make an approximation towards the goats; the caprine features being perhaps more pronounced in the latter than in the former.

Both species exhibit that "perversion" in the direction of the upper part of the horns of the rams characterising those of the red sheep,[1] which reappears in the goat-like Pallas's tur, or so-called Caucasian bharal, of the Eastern Caucasus.

In the arui the suborbital face-glands are cer-

[1] *Vide supra*, p. 17.

tainly absent, and the same appears to be the case with interdigital foot-glands.[1] In the bharal the face-glands are likewise lacking, while the foot-glands are represented, at most, by insignificant vestiges; the whole structure of the foot being, indeed, essentially that of a goat. In fact, although the rams lack a "goaty" odour and a beard on the chin, the bharal comes in many respects decidedly nearer to Pallas's tur than it does to the typical sheep.

The heavy fringe of long hair clothing the throat, neck, and fore-quarters, and the great relative length of the tail, serve at once to distinguish the North African arui, udad, or Barbary sheep (*Ammotragus lervia*, or *A. tragelaphus*) from all other wild sheep. The horns of the rams are of the same general type as those of the bharal, but show a distinctive kind of transverse wrinkling when young and unworn; those of ewes being only slightly smaller. In correlation with the lack of face-glands, the skull has no suborbital pits.

The arui is a large sheep, standing about 39 inches at the shoulder, and falling away towards the croup. Its whole make is distinctly heavy and ungainly; the head being relatively long and somewhat donkey-like, with, for a wild sheep, rather large ears. From the nape of the neck to some distance behind the withers runs a short "hogged" mane;

[1] See Pocock, *Proc. Zool. Soc.*, 1910, p. 872.

and adult rams are also clothed with a fringe of long straight hair on the throat, which is continued downwards till it divides on the chest to terminate at the upper part of each fore-leg; this fringe reappearing, after a short gap, on the front and outer sides of the legs nearly down to the knees, below which the long hair hangs for some distance. The long and terminally tufted tail reaches within a few inches of the hocks.

The horns of adult rams, which may occasionally measure 28 inches or a little more in length, with a basal girth of a little more than 11 inches, and a tip-to-tip interval of just over 18 inches, show a distinct keel at the base of the front surface, and have their tips directed inwards, or inwards and somewhat downwards; their colour being yellowish brown, but tending to darken in old animals. The aforesaid transverse wrinkles found in young horns, and traces of which are frequently retained near the tips of those of old rams, have a wavy form. With the exception of the inner sides of the ears, the chin, the middle line of the belly, and the inner surfaces of the upper portions of the limbs, which are whitish, and the presence of a few dark bars in the throat-fringe, the colour of the arui is uniform rufous tawny, with a tendency to become darker on the mane, but, so far as known, exhibiting no marked seasonal variation.

This remarkable sheep—the only wild member

of the group inhabiting the African continent—is a native of the Atlas and other mountain ranges of North Africa ; its distribution extending from within a short distance of the Atlantic sea-board to the Egyptian Sudan. In the Atlas it is restricted to the hot and dry slopes of the southern flank, which overlook the Sahara desert. In such haunts, where the rocks are for the most part reddish or yellowish, the arui is rendered almost indistinguishable from its surrounding by its rufous tawny coat. Water is everywhere scarce, and the arui, according to native report, have often to travel a long distance before they can slake their thirst ; in accordance with this, they are stated to seldom drink more than once in four or five days. They keep strictly to the open country, never entering the cedar-forests, and frequent more precipitous ground than typical wild sheep. As a rule, they are to be met with in small parties of four or five ; the ewes produce one or two lambs at a birth, after, it is said, a gestation of about 160 days.

The arui also inhabits the desert to a distance of about 1000 miles south of Biskra ; and this desert form, which is probably identical with the one inhabiting the Eastern Sudan, may be distinct from the Atlas arui. If this prove to be the case, the latter will have to be known as *Ammotragus lervia tragelaphus*.

In the large size of the horns of the females and

the great length of the tail in both sexes the arui differs from all other wild sheep, as it also does from wild goats.

Unlike the arui, the bharal (*Pseudoïs nahura*) is a parti-coloured ruminant, readily distinguished from all other wild sheep by this feature, combined with the peculiar character of the horns of the rams, which are rounded or subquadrangular at their bases, and are directed at first backwards and outwards, and then inwards and upwards in an S-like curvature, with the surface nearly smooth, except for the transverse rings of growth. The horns of the ewes are also distinctive, being short, approximated at the base, much compressed from back to front, and bending upwards in a somewhat scimitar-like style. The tail is rather longer than in ordinary wild sheep. Equally characteristic is the colouring, which in adult rams displays a conspicuous black flank-band dividing the fawn of the back from the white of the belly, as well as black stripes down the front of all four legs, a dark streak down the face, and a black tip to the tail. In size the bharal stands about 36 inches at the withers; the build is rather heavy, the head long and narrow, the ear short, and the coat thick and close, without a mane on the neck or a ruff on the throat. The general colour of the hair on the rest of the upper-parts is brownish grey with a tinge of slaty blue, tending more to brown in summer and more to slaty grey in winter; but the

under-parts, the inner and hind surfaces of the legs, and the buttocks as far as the root of the tail are white. The dark stripe down the fore-leg is interrupted by a white patch at the knee. The horns are blackish olive, and may measure as much as 32 inches in length, with a basal girth of rather more than 13 inches, and a tip-to-tip interval of some 22 inches. The ewe of the bharal is much less strikingly coloured than the ram, lacking the black markings of the latter at all ages.

The geographical distribution of the bharal extends from near Shigar in Baltistan, and near Sanju, south-east of Yarkand, through Ladak to Moupin and Shen-si in western China, as well as the adjacent parts of Tibet, and from the main Himalayan axis, or in places the high ground south of it, to the Kuenlun and Altyn Tagh. Bharal are never found below about 10,000 feet; and in summer are usually seen from about 14,000 to 16,000 feet.

"In habits as in structure," writes Dr. Blanford,[1] "the bharal is intermediate between the sheep and the goats. Like the former it is found on undulating ground, and frequently lies down during the day on its feeding-ground, though generally amongst stones; but, like the latter, it is a splendid climber, perfectly at home on precipitous cliffs, and wont, when alarmed, to take refuge in ground inaccessible

[1] *Fauna of British India—Mammalia*, p. 501.

to man. It is found in herds of from 8 or 10 to 50 or even 100; the males and females being generally found apart in the summer, but frequently associating together at all seasons. The herds keep to high open ground above forest and never enter bush even. They feed and rest alternately during the day; owing to their colour it is peculiarly difficult to make them out when they are lying down amongst stones. Their flesh is excellent, especially about September, when they are in good condition.

"The bharal is easily tamed if taken young, and has bred freely in the Zoological Gardens, Regent's Park. The period of gestation has not, however, been accurately determined; it is 160 days according to Hodgson. This animal has never been known to breed with tame sheep."

Napo is the Tibetan name of this sheep.

CHAPTER XV

SOME EXTINCT SHEEP

As already mentioned, the geological history of sheep is still very imperfectly known, and such extinct species as have been described throw little or no light on the origin of the group, which appears to be relatively modern. In the chapter on the mouflon reference has been made to certain fossil sheep more or less nearly related to that species, and the present chapter contains a brief account of such other extinct representatives of the group as have been described.

In the year 1880, Mr. E. T. Newton described,[1] under the name of *Caprovis savini*, a fragment of the frontal region, with a considerable portion of one horn-core, of the skull of a sheep from the so-called Forest-bed of the Norfolk coast, which belongs to the early part of the Pleistocene, or latest, epoch of geological history. In size and in the curvature of the horn this specimen has been stated to agree rather closely with the corresponding portion of the skull of the continental representatives of the red sheep (*Ovis orientalis*), although the

[1] *Geological Magazine*, decade 2, vol. vii. p. 449, 1886.

horn-core is furrowed by deep flutings not observable in that of the latter. The comparison with the red sheep is, however, altogether misleading, as the fragment of the right horn-core which remains is sufficient to show that its curvature corresponded in the main with that of the mouflon, although the fossil frontlet seems to indicate a somewhat larger sheep, which may have been allied to the Asiatic urial. The proper name of the Forest-bed sheep is, of course, *Ovis savini*.

Remains of a large sheep from the Pleistocene deposits of the south of France described in the year 1879 by Pommerol[1] under the name of *Ovis antiqua* have been subsequently regarded by Dr. A. Nehring[2] as representing a species near akin to the existing Marco Polo's argali of the Pamirs of Central Asia. From the Pleistocene of Moravia Dr. Nehring[3] described at the same time the remains of another member of the argali group, for which he proposed the name *O. argaloides*. A third representative of the same group, from the Pleistocene of Transbaikalia, has been described by Madam Pavlow,[4] under the name of *Ovis ammon fossilis*.

The bighorn group appears to be represented by remains from the superficial formations of Siberia,

[1] *Comptes Rendus Assoc. Franç. Avanc. Sci.*, 1879, p. 60.
[2] *Jahrbuch für Mineralogie*, 1891, vol. ii. p. 150.
[3] *Ibid.*, p. 116.
[4] *Trav. Soc. Imp. Russ. Geogr.—Sect. d'Amour*, vol. xiii. p. 26, 1911.

the New Siberian Islands, and Northern Europe, for which the names *O. nivicola fossilis*[1] and *O. montana fossilis*[2] have been proposed. The *O. mamillaris* of Hildreth,[3] from the Pleistocene of North America, may undoubtedly be assigned to the same group, and the same is probably the case with a horn-core from the same horizon and area originally described by Professor E. D. Cope as a bison under the name of *Bos scaphoceras*, but subsequently considered by Dr. F. A. Lucas[4] to more probably belong to a sheep.

Lastly, it is considered that certain remains from the surperficial deposits of the south of France described under the names of *O. tragelaphus fossilis*,[5] *O. magna*,[6] and *O. primæva*[7] represent sheep akin to the modern arui of North Africa.

As already indicated, not one of these extinct sheep throws a single ray of light on the origin and relationship of the group.

[1] Tschersky, *Mém. Acad. Sci. St. Pétersburg*, vol. xl. p. 187, 1892.
[2] Brandt and Woldrich, *ibid.*, 1887, p. 111.
[3] *Amer. Journ. Sci.*, vol. xxxi. p. 82, 1837.
[4] *Proc. U.S. Nation. Mus.*, vol. xxi. p. 756, 1899.
[5] M. de Serres, *Oss. foss. Cavernes*, 1848, p. 149.
[6] Garrigou, in the work cited in the next note.
[7] Gervais, *Zool. et Paléontologie Françaises*, p. 76, Paris, 1852.

INDEX

ADIMAIN sheep, 213
Africander fat-tailed sheep, 178
African sheep, 212
Alaskan bighorn, 294
Alatau argali, 275
Altai argali, 272
Ammotragus lervia, 302; *tragelaphus*, 302
Anatolian sheep, 257
Anau deposits, 151
Ancestry of domesticated breeds, 41
Ancon sheep, 37
Andalucian sheep, 76
Angolan maned sheep, 236
Arabian long-tailed sheep, 186
Aragonese sheep, 136
Ardennes sheep, 133
Argali, 268, 272; Alatau, 275; Altai, 272; Bokharan, 279; Kulja, 276; Mongolian, 271; Pamir, 282; Saiar, 275; Tibetan, 269
Arkal, 261, 265
Armenian sheep, 256
Arui, 302
Asiatic Highlands, sheep of, 154
Astrakhan, 173, 177, 189, 192; fat-tailed sheep, 171
Australian sheep, 251

BALUBA maned sheep, 336
Baluchi urial, 264
Bampton Notts sheep, 115
Barbary fat-tailed sheep, 182; sheep, 302
Barwal sheep, 158
Bayonne sheep, 133
Bedouin long-tailed sheep, 186
Berrichone sheep, 132
Bharal, 309
Bighorn, 285; Alaskan, 294; black, 294; Clifton's, 298; grey, 294; Kamchatkan, 297; Mexican, 289; Rocky Mountain, 285; Sonoran, 291; white, 294
Black bighorn, 294
Black-faced Highland, 88
Black-headed sheep, 204
Blue sheep, 309
Bokharan argali, 279; fat-tailed sheep, 171
Bos scaphoceras, 310
Brazilian long-legged sheep, 220; sheep, 249
Breton sheep, 134
British sheep, 57, 78
Bündner sheep, 144
Buriatic fat-rumped sheep, 202

CABRANOS, 32
Cago sheep, 160
Caithness sheep, 65
Cameruns maned sheep, 238
Cannock Chase sheep, 85
Cape fat-tailed sheep, 178
Caprovis musimon, 46; *savini*, 308
Chabins, 32
Cheviot sheep, 91
Chilian sheep, 247
Churra sheep, 136
Circassian long-tailed sheep, 191
Clifton's bighorn, 298
Colchian long-tailed sheep, 188
Colly, 91
Colombian sheep, 250
Colouring, protective, 43
Congo long-legged sheep, 223
Copper Age sheep, 55

Coquo sheep, 236
Corsican sheep, 130
Cotswold sheep, 118
Criotherium, 42
Cyprian sheep, 255

DANISH sheep, 74
Dartmoor sheep, 85
Daurian fat-rumped sheep, 198
Delaine merino, 127
Diffusion of sheep, 245
Dinka sheep, 235
Distribution of sheep, 27
Domesticated breeds, ancestry, 41
Dorset sheep, 98
Dumba sheep, 170
Dun-faced Andalucian sheep, 76

EARLESS Shanghai sheep, 165
Eastern origin of sheep, 2
Egyptian fat-tailed sheep, 183; long-legged sheep, 227
Elburz sheep, 258
Estridge wool, 74
Ewe, 3
Exmoor sheep, 86
Extinct sheep, 312

FACE-GLANDS, 18
Fat-rumped sheep, 193
Fat-tailed sheep, 168
Fertility, 40
Fezzan long-legged sheep, 225
Fighting rams, 159
Foot-glands, 18
Forest of Dean sheep, 101
Four-horned piebald sheep, 239; sheep, 61, 68
French sheep, 75, 131
Friesian sheep, 135

GEESTSCHAF, 74
German sheep, 73, 134
Gestation, 39
Glands, face, 18; foot, 18
Gmelin's sheep, 253
Goat and sheep hybrids, 31
Goitred sheep, 229
Grey bighorn, 294
Guinea long-legged sheep, 220, 249

HABITS of sheep, 27
Haluk sheep, 155
Hampshire down, 107
Hausa sheep, 224
Heath sheep, 71
Hebridean sheep, 62
Hedjaz fat-rumped sheep, 267
Herdwick sheep, 87
Heteronymous, 14
Highland sheep, 88
History of sheep, 1
Holstein sheep, 74
Homonymous, 14
Horn-spirals, 14
Hunia sheep, 155
Hybrid sheep and goats, 31, 71

IBERIAN sheep, 136
Irish sheep, 83
Ispahan sheep, 259
Italian sheep, 129

KALMUK fat-rumped sheep, 201
Kamchatkan bighorn, 297
Keeries, 65
Kirghiz fat-rumped sheep, 199
Kopet Dagh urial, 147
Kulja argali, 276

LADAK sheep, 164
Laine d'Autruche, 74
Lamb, 3; Persian, 177; Ukrainer, 192
Laristan sheep, 260
Leicester sheep, 116
Levantine fat-tailed sheep, 180
Lincoln sheep, 112
Loaghtan sheep, 59
Long-legged sheep, 218
Long-tailed sheep, 168
Long-woolled sheep, 110
Lop-eared sheep, 213

MACEDONIAN fat-tailed sheep 181; sheep, 128
Manchega sheep, 136
Maned sheep, 233; Fezzan sheep, 231
Manx sheep, 61
Marco Polo's sheep, 282
Mauchamp merino, 39

Mecca fat-rumped sheep, 207
Medium-tailed sheep, 121
Mendés sheep, 226
Merino, 121 ; Mauchamp, 39
Merinos in Peru, 247
Mexican bighorn, 289
Minos period in Crete, 150
Moldavian sheep, 129
Mongolian argali, 271 ; fat-rumped sheep, 198
Moroccan maned sheep, 237
Morvant de la Chine, 237
Mouflon, 46; red, 253
Muana-coquo, 236
Münster sheep, 217
Musimon, 46
Musmon, 46
Mycenean sheep, 148

NALPSER sheep, 146
Names of sheep, 1
Napo, 307
Negrette merino, 127
Nigerian long-legged sheep, 224
Norfolk sheep, 95
Normandy sheep, 75, 134
North American sheep, 250
Nubian fat-rumped sheep, 208

ORIGIN of sheep, 42
Orkney sheep, 64
Otter sheep, 37
Ovis ægyptiaca, 184 ; *africana*, 232 ; *alleni*, 300 ; *ammon*, 268, 272; *anatolica*, 257; *antiqua*, 53, 309 ; *argaloides*, 53, 309 ; *arkal*, 147, 265; *aries*, 1, 47; *auduboni*, 289; *blanfordi*, 264 ; *borealis*, 298; *brookei*, 271 ; *brachyura*, 58; *californica*, 288; *canadensis*, 288 ; *carnapi*, 224 ; *catotis*, 213 ; *cervina*, 288 ; *congensis*, 223 ; *corneri*, 54 ; *cremnobates*, 292 ; *cyprica*, 254 ; *dalli*, 294 ; *dolichura*, 170, 186 ; *erskinei*, 258 ; *fannini*, 294 ; *fossilis*, 309 ; *gaillardi*, 291 ; *gmelini*, 256 ; *heinsi*, 281 ; *hodgsoni*, 269 ; *ispahanica*, 260 ; *jubata*, 232, 271 ; *karelini*, 275 ; *laristanica*, 260 ; *libyca*, 225 ; *littledalei*, 276 ; *longipes*, 218 ; *magna*, 310 ; *mamilaris*, 310 ; *mannhardi*, 53; *matschiei*, 52; *mexicana*, 289 ; *montana*, 310; *musimon*, 46 ; *nelsoni*, 290 ; *nigrimontana*, 279 ; *nivicola*, 297 ; *ophion*, 254 ; *orientalis*, 253, domestication of, 149; *pachycerca*, 170, 204 ; *palæoægyptius*, 227 ; *palustris*, 144 ; *platura*, 170, 184 ; *poli*, 282 ; *primæva*, 310 ; *sairensis*, 275 ; *savini*, 309 ; *sierræ*, 290 ; *steatinion*, 229 ; *steatopyga*, 170 ; *stonei*, 294 ; *storcki*, 275 ; *strepsiceros*, 137 ; *studeri*, 54 ; *tragelaphus*, 310 ; *urmiana*, 257 ; *varentzowi*, 265 ; *vignei*, 261
Oxford down, 106

PAMIR argali, 282
Parnassian sheep, 128
Pelleries, 32
Peluk sheep, 157
Persian fat-rumped sheep, 209 ; fat-tailed sheep, 176 ; lamb, 177
Peruvian sheep, 246
Pigmy maned sheep, 238
Pink-nosed Somerset, 99
Poitou sheep, 133
Protective colouring, 43
Pseudoïs nahura, 305

RADNOR sheep, 82
Ram, 3 ; fighting, 159; unicorn, 160
Rambouillet merino, 122, 127
Rasko sheep, 141
Red mouflon, 253 ; sheep, 253
Relation of sheep and goats, 30
Rocky Mountain bighorn, 285
Romney Marsh sheep, 114
Ronaldshay sheep, 65
Rumination, 10
Russian sheep, 69
Ryeland sheep, 100

ST. KILDA sheep, 60
Saiar argali, 275
Sardinian sheep, 130
Scandinavian sheep, 68

Senegal maned sheep, 237
Sha, 261
Shanghai earless sheep, 165
Shapo, 261
Sheep, Adimain, 231; African, 212; Africander fat-tailed, 178; Anatolian, 257; and goat hybrids, 31, 71; and goats, relationship of, 30; Andalucian, 76; Angolan maned, 236; Arabian long-tailed, 186; Aragonese, 136; Ardennes, 133; Armenian, 256; Asiatic short-tailed, 154; Astrakhan fat-tailed, 171; Australian, 251; Baluba maned, 236; Bampton Notts, 115; Barbary, 302; Barbary fat-tailed, 102; Barwal, 158; Bayonne, 133; Bedouin long-tailed, 186; Berichone, 132; bighorn, 285; black-headed, 204; blue, 309; Bokharan fat-tailed, 171; Brazilian, 249; Brazilian long-legged, 220; Breton, 134; British, 57, 58; Bündner, 144; Buriatic fat-rumped, 202; cago, 160; Caithness, 65; Cameruns maned, 238; Cannock Chase, 85; Cape fat-tailed, 178; Cheviot, 91; Chilian, 247; churra, 136; Circassian long-tailed, 191; Colombian, 250; Congo long-legged, 223; Copper Age, 55; coquo, 236; Corsican, 130; Cotswold, 118; Cyprian, 255; Danish, 74; Dartmoor, 85; Daurian fat-rumped, 198; diffusion of, 245; Dinka, 235; distribution of, 27; Dorset, 98; dumba, 170; earless Shanghai, 165; Eastern origin, 2; Egyptian fat-tailed, 183; Egyptian long-legged, 227; Elburz, 258; European short-tailed, 57; Exmoor, 86; extinct, 312; fat-rumped, 193; fat-tailed, 168; Fezzan long-legged, 225; Fezzan maned, 231; Forest of Dean, 101; four-horned, 61, 68; four-horned piebald, 239; French, 75, 135; Friesian, 135; German, 73, 134; glands of, 18; Gmelin's, 253; goitred, 229; Guinea long-legged, 220, 249; habits of, 27; haluk, 155; Hampshire down, 107; Hausa, 224; heath, 71; Hebridean, 62; Hedjaz fat-rumped, 207; Herdwick, 87; Highland, 88; history of, 1; Holstein, 74; Hunia, 155; Iberian, 136; Irish, 83; Ispahan, 259; Italian, 129; Kalmuk fat-rumped, 201; Kirghiz fat-rumped, 199; Ladak, 164; Laristan, 260; Leicester, 116; Levantine fat-tailed, 180; Lincoln, 112; Loaghtan, 59; long-legged, 218; long-tailed, 168; long-tailed Colchian, 188; long-woolled, 110; lop-eared, 213; Macedonian, 128; Macedonian fat-tailed, 181; maned, 233; Manchega, 136; Manx, 61; Marco Polo's, 282; Mecca fat-rumped, 207; medium-tailed, 121; Mendés, 226; merino, 121; Moldavian, 129; Mongolian fat-rumped, 198; Moroccan maned, 237; Münster, 217; Mycenean, 148; Nalpser, 146; names of, 1; Nigerian long-legged, 224; Norfolk, 95; Normandy, 75, 135; North American, 250; Nubian fat-rumped, 208; of Asiatic Highlands, 154; origin of, 42; Orkney, 64; Oxford down, 106; Parnassian, 128; peluk, 157; Persian fat-tailed, 176; Persian fat-rumped, 209; Peruvian, 246; pigmy maned, 238; Poitou, 133; Radnor, 82; rasko, 141; red, 253; Romney Marsh, 114; Ronaldshay, 65; Russian, 69; Ryeland, 100; St. Kilda, 60; Sardinian, 130; Scandinavian, 68; Senegal maned, 237; Shetland, 64; short-tailed, 51; Shropshire, 108; Silinga, 157;

skull of, 19, 29; Soa, 59; Sologhote, 133; Somali fat-rumped, 204; South African, 241; South American, 246; Southdown, 103; Southam Notts, 115; Spanish, 135; stomach of, 16; structure of, 8; Suffolk down, 102; Syrian fat-tailed, 175; Tarentinian long-tailed, 189; Tatarian fat-rumped, 194; teeth of, 22; Tunisian fat-tailed, 182; turbary, 144; unicorn, 160; Urmian, 257; value of, 44; Wallachian, 137; Wallis, 146; Welsh, 81, 82; West Indian long-legged, 220; wild, 46, 252; Wiltshire, 95; wool of, 25; zackel, 137; zoological position of, 8; zunu, 229
Shetland sheep, 64
Short-tailed sheep, 57, 154
Shropshire sheep, 108
Silinga sheep, 157
Skull, 19, 29
Soa sheep, 59
Sologhote sheep, 133
Somali fat-rumped sheep, 204
Somerset pink-nosed, 99
Sonoran bighorn, 291
South African sheep, 246
South American sheep, 246
Southam Notts sheep, 115
Southdown, 103
Spanish sheep, 135
Spirals of horns, 14
Stomach, 10
Structure of sheep, 8
Succession of teeth, 22
Suffolk down, 102
Syrian fat-tailed sheep, 175

TAIL, 17
Tarentinian long-tailed sheep, 189
Tatarian fat-rumped sheep, 194
Taye, 285
Teeth, 22; succession of, 22
Teg, 7
Tibetan argali, 269
Tunisian fat-tailed sheep, 182
Turbary sheep, 144
Turkestan, prehistoric sheep, 147

UDAD, 302
Ukrainer lamb, 192
Unicorn rams, 160
Urial, 261, 265; Baluchi, 264; Kopet Dagh, 147
Urin, 261, 264
Urmian sheep, 257

VALSER Schaf, 146
Value of sheep, 44

WALLACHIAN sheep, 137
Wallis sheep, 146
Welsh sheep, 81, 82
West Indian long-legged sheep, 220
Wether, 4
White bighorn, 294
Wild sheep, 46, 252
Wiltshire sheep, 95
Wool, 25; Estridge, 74

ZACKELSCHAF, 137
Zoological position of sheep, 8
Zunu sheep, 229

Printed by BALLANTYNE, HANSON & Co.
Edinburgh & London

RET'D APR 30 1986

DEC 8 1991

APR 23 1995

MAR 31 1997

QL737.U5L78
The sheep and its cousins
3 0629 0066550 1
DEMCO